STRATEGIES TO DEVELOP, IDENTIFY, AND SUSTAIN STRUCTURAL CHANGES FOR OBESITY PREVENTION IN NATIVE AMERICAN COMMUNITIES: FORMATIVE RESEARCH FINDINGS FROM OPREVENT2

by

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A dissertation submitted to Johns Hopkins University in conformity with the requirements for the degree of Doctor of Philosophy

Baltimore, Maryland

September 2018

Abstract

The burden of obesity and non-communicable diseases presents a threat to the welfare of Tribal Nations. Though Tribes have participated in traditional food systems for millennia, federal and state policies have limited Tribes' ability to engage in these systems and have negatively impacted Native American (NA) health. Structural change is needed to effectively prevent and control obesity by promoting healthy food and physical activity environments. This dissertation research occurred during the formative and baseline data collection stages of OPREVENT2, a multi-level, multi-component (MLMC) obesity prevention trial with six NA communities in the Midwest and Southwest. The goals of this research were to identify strategies to promote policy, systems, and environmental (PSE) changes and to sustain OPREVENT2 activities beyond the funding period in partnership with communities. Based on these goals, we aimed to (1) describe the ways that NA communities developed PSE changes using modified Grounded Theory methodology; (2) identify potential PSE changes based on community baseline data using latent class analysis; and (3) describe the facilitators and barriers to sustaining the OPREVENT2 intervention using an existing conceptual framework to frame our findings. To achieve these aims, we collected qualitative data in three communities (including in-depth interviews, observations, modified talking circles, and workshop) as well as baseline data from 100 randomly selected participants from three communities regarding community food and physical activity environments, sociodemographic variables, and anthropometric variables. In Paper 1 (Chapter 4), we developed a conceptual framework that describes the processes and actors that were involved in promoting PSE change in NA communities. In Paper 2 (Chapter 5), we described the

latent household and community food and physical activity environments of three NA communities and suggested potential intervention strategies based on the identified of high and low access subgroups. In Paper 3 (Chapter 6), our analysis described nine themes that impacted sustainability, including institutional capacity and funding, which were found to be central to promoting sustained intervention work. Our findings contributed to the development of the OPREVENT2 Community Action Component, which works in partnership with communities via monthly coalition meetings to develop PSE changes and sustain OPREVENT2 activities.

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Acknowledgements

I would like to thank my advisor, Dr. Joel Gittelsohn, for his guidance and mentorship over the course of my master's and doctoral education programs at the Johns Hopkins School of Public Health (JHSPH). I am very grateful to have worked on his obesity prevention projects working in Native communities, OPREVENT1 and OPREVENT2; this opportunity has allowed me to learn so much about conducting research with Native communities that has been an invaluable supplement to my training.

I am very grateful to my thesis and oral exam committee members who have provided guidance on my research over the years, including Drs. Peter Winch, Karen Bandeen-Roche, Allison Barlow, Jessica Jones-Smith, David Jernigan, and Gerard Anderson. I would also like to acknowledge Drs. Caitlin Kennedy and Victoria O'Keefe, who provided guidance during weekly writing meetings. These meetings gave me many opportunities to ask for advice while also providing much-needed company during the long writing process. Thanks also to Kristen Speakman for her guidance throughout my doctoral training and for her support in developing my dissertation proposal.

I would like to thank the partnering communities of the OPREVENT2 study, without whom this research would not be possible. Thank you for your ongoing partnership and trust in our research team. Thanks also to the many participants of this research who gave their time for the benefit of OPREVENT2 intervention components and this research. I would like to especially thank the community members and participants from the OPREVENT2 pilot communities who welcomed me into their communities and were incredibly generous in sharing their time and knowledge with me.

Thank you to the OPREVENT team who have become family in this journey to promote Indigenous health. Such an ambitious project would not possible without everyone's hard work. Thank you to Leslie, Lisa, and Caroline for their ongoing contributions and dedication to ensuring the strength of both the research and intervention program. Thank you to Marla, Harrison, Elverna, Tenley, Felicia, Lori, Jacqueline, and Mary for their incredible efforts in collecting data and implementing the programs in our partner communities. Thanks for helping me to feel at home during my fieldwork and for your continued engagement to improve the food and physical activity environments of Native communities. Obesity prevention can be challenging, though the struggle to promote healthy communities and environments is essential to impacting Native health and I'm glad to have shared this experience with you.

I feel lucky to have experienced this academic journey alongside some incredible fellow students and friends from my time at JHSPH, including Georgia, Emily, Kwame, Fan, Yukyan, Amanda, Anna, Jess, Elena, Talia, Steph, and Nina. Your tenacity and compassion are an unending source of inspiration. Thank you for sharing in the celebrations along the way and uplifting and regenerating me when I needed it most. I want to recognize the role of the Native Circle student group, which has provided much-needed support from outstanding and resilient students and faculty. I am encouraged to see more Native students and faculty across JHU and hope that our school becomes even more of a base for Native health research and graduate training. I feel very fortunate to have some wonderful friends from my reservation in Akwesasne who now call me "Johnny Hopkins". Niawen to Ashley and Sateiokwen for their music therapy and for

sending me encouraging messages along the way. Thanks also to Catiria for your encouragement and support.

I am incredibly fortunate to have received funding from the Gates Millennium Scholars Program, which has supported me throughout my post-secondary education. I would also like to thank the International Health Tuition Scholarship, the Center for American Indian Health American Indian Scholarship, the Saint Regis Mohawk Tribe, and Akwesasne Mohawk Board of Education for supporting my graduate education at JHSPH.

Niawenkó:wa to my family in Akwesasne, who have encouraged me to pursue my education and provided an indescribable amount of support and encouragement during my many years away from home. My grandparents, Felicia and Hubert Jock, have particularly inspired and encouraged our family to pursue education and I am so grateful for their unconditional love and reassurance. My Dad and Virginia, Natalie and family, and Kathy and family have always provided helpful guidance and much-needed downtime from my studies and research. I am particularly grateful to my Dad, Richard Jock, for being such a wonderful role model for championing First Nations health and wellness and for supporting all of my personal and professional goals. My husband, Jeremy McCann, has been a boundless supporter and refuge during my graduate school journey. Thank you for coming on this adventure with me and for always cheering for me. Kwanorónhkwa; I hope to make you all proud.

Niá:wen Takia'tison ne watkwanonhwerá:ton. *Thank you, You who made me and I send you my greetings, thanks, and love.*

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List of terms and abbreviations

Tribal Nations (TNs) and Native Americans (NAs)

The terms “American Indian,” “Indian”, “Native American,” and “Native,” are often used interchangeably to refer to the Indigenous peoples of the lower 48 states of the United States, while the term “First Nations” is the term commonly used to describe those with Indian Status in Canada. Neither of the terms “American Indian” or “Native American” are entirely accurate and fail to recognize both the sovereignty Tribal Nations and the diversity of the over 500 Tribal Nations. Native Americans are heterogeneous in terms of their culture, languages, and history; though they have a common history of genocide and assimilation. For the purposes of this dissertation, the term “Tribal Nations” (TNs) will be used to describe the sovereign federally- or state-recognized Native American Tribes and governments in the United States, while the terms “Native American” or “Native” will refer to the people in general and their tribal communities.

Non-communicable diseases (NCDs)

Multi-level, Multi-component (MLMC)

Indian Health Service (IHS)

Obesity Prevention Research and Evaluation of interVention Effectiveness in NaTive North Americans 1 (OPREVENT1)

Obesity Prevention Research and Evaluation of interVention Effectiveness in NaTive North Americans 2 (OPREVENT2)

Body Mass Index (BMI)

Policy, Systems, and Environmental (PSE) Change

Food Distribution Program for Indian Reservations (FDPIR)

Latent Class Analysis (LCA)

Household (HH)

Johns Hopkins School of Public Health (JHSPH)

Institutional Review Board (IRB)

Chapter 1. Introduction

1.1 Problem Statement

Certain racial groups in the US face a disproportionate burden of obesity, with Native Americans (NAs) facing the highest prevalence (Indian Health Service, 2008). Although unhealthy diet and physical inactivity have been recognized as the major independent risk factors of non-communicable diseases (NCDs) (i.e., cardiovascular diseases, cancer, chronic respiratory diseases, diabetes), obesity is also recognized as an important mediator of these relationships and therefore a target for primary prevention (Wagner & Brath, 2012; World Health Organization, 2005). Among NAs, approximately one of every two adults and one of every three children are obese (Indian Health Service, n.d.). These obesity rates have great impacts for future generations of Tribal Nations (TNs), because of the strong association between obesity and subsequent development of NCDs. NA populations have experienced a nutrition transition over the last 50 years, characterized by reduced participation in traditional food practices, and reduced physical activity (Compher, 2006a; Story, Strauss, Zephier, & Broussard, 1998), suggesting an important role of the food and physical activity environments in obesity and NCD prevention. While there is limited evidence to support the long-term effectiveness of obesity prevention interventions targeting individual-level factors alone, there is growing recognition that support structural interventions are necessary to create lasting impact (Cohen, Scribner, & Farley, 2000). There is also a need for structural interventions that can effectively prevent and control obesity by promoting healthy food and physical activity access at upstream levels of influence, particularly in NA communities

experiencing a high obesity burden (Hutchinson & Shin, 2014; Sotero & Vegas, 2006; Yach, Stuckler, & Brownell, 2006).

Despite increasing interest in enacting obesity prevention and control policies at the federal, state, and municipal jurisdictions, the scholarly literature focusing on tribal health policies and other structural changes is comparatively underdeveloped. One study, the American Indian Healthy Eating (AIHE) project, worked with seven state-recognized NA communities in North Carolina to develop and implement tribally-led policy strategies to promote access to and consumption of healthy foods (Fleischhacker et al., 2012a). The Healthy Children, Strong Families study combined structural and individual-level intervention approaches and resulted in decreased environmental barriers to healthy eating and physical activity (Communities, Adams, Scott, Prince, & Williamson, 2014). This previous work has several limitations which this proposal intends to address. First, conceptual frameworks for understanding agenda setting in Tribal Governments are needed, but these need to be grounded in existing processes for developing policy, systems, and environmental change. Second, using community-specific data can highlight subclasses of populations and thus opportunities for policies to promote healthy food and physical activity environments. Latent class analysis can be used to highlight the unique policy needs and has not been used previously. Third, qualitative methods have yet to be used to understand stakeholder perspectives of barriers and facilitators to sustaining multi-level, multi-component (MLMC) obesity prevention programs in NA communities, allowing an opportunity to develop lessons learned for this growing area of interest.

The specific aims of this dissertation research are as follows:

Aim 1: Develop a conceptual framework describing the processes for making policy, systems, and environmental (PSE) changes in NA communities using a modified Grounded Theory methodology.

Aim 2: Conduct latent class analysis using the OPREVENT2 baseline sample to identify and describe the household- and community-level food and physical activity environments of participating NA communities.

Aim 3: Describe the barriers and facilitators to sustaining OPREVENT2, an MLMC obesity prevention program in NA communities.

The proposed study will facilitate the development of a Community Action Component for OPREVENT2, an MLMC obesity prevention study to be implemented in six NA communities of the Midwest and Southwest beginning in 2017. This new component aims to support the sustainability of the OPREVENT2 activities by partnering with tribal stakeholders to promote structural interventions in their communities. OPREVENT2 will be the first known MLMC obesity prevention program with a focus on promoting structural changes to the food and physical activity environments by working with Tribal Governments and communities.

1.2 Summary of dissertation chapters

This dissertation comprises seven chapters. Chapter 2 provides a literature review of research pertinent to the topic. This chapter includes an overview of the prevalence of obesity and NCDs in Native communities, the role of nutrition and physical activity in the development of obesity, a review of the nutrition transition and modern food and physical activity environments of NA communities, an overview of structural intervention approaches, and previous research structural interventions in Native

communities, multi-level, multi-component obesity prevention programs as well as limitations of this previous research.

Chapter 3 describes the methods utilized to achieve our three aims. This includes a description of the data collection phases, description of the OPREVENT2 study, background and funding for this research, theoretical frameworks for the intervention and analyses, description of the community selection process, description of communities included in our analyses, study timeline, data collection training, data management, data analysis, and ethical approvals.

Chapter 4 (Paper1) presents the results of our modified Grounded Theory analysis which describes the processes for developing policy, systems, and environmental change in NA communities

Chapter 5 (Paper 2) describes the household and community food and physical activity environments of three NA communities. Latent class analysis was used to identify latent variables of these environments and we describe their sociodemographic correlates.

Chapter 6 (Paper 3) provides a description of the facilitators and barriers to sustaining OPREVENT2 in three NA communities.

We provide overall research conclusions in Chapter 7 and review the findings of each paper (Chapters 4-6), describe the OPREVENT2 Community Action Component, which was developed from this work, as well as describe the lessons learned and implications for this research.

This study was funded by the National Heart, Lung, and Blood Institute (R01HL122150; J. Gittelsohn).

Chapter 2. Literature review

2.1 Prevalence of obesity Among Native Americans (NAs)

The prevalence of obesity in the United States (US) has drastically increased over the last 30 years; adult prevalence has doubled while childhood prevalence has tripled (Flegal, Carroll, Ogden, & Curtin, 2014; Segal, Rayburn, & Martin, 2017). Obesity is an excess of body fat that is large enough to result in shortened lifespan or reduced health (Allison et al., 2008). Population trends in adult obesity are often classified using body mass index (BMI) using BMI values of 30 kg/m^2 or higher to indicate obesity, a cutoff established due to its relation to elevated chronic disease risk (WHO Expert Committee, 1995). Based on 2011-2012 National Health and Nutrition Examination Survey (NHANES) data, it is estimated that 16.9% of youth aged 2-19 years and 35.1% of adults aged 20 years and older in the US are classified as obese (Ogden, Carroll, Kit, & Flegal, 2014). A recent analysis of NHANES data from the 2009-2016 cycle demonstrates that childhood obesity and severe obesity are continuing to rise, particularly for children aged 2-5 years, contrary to previous reports that obesity prevalence had stabilized (Skinner, Ravanbakht, & Skelton, 2018).

The burden of obesity has not been evenly distributed, with NAs experiencing far higher burdens compared to the national population and other race/ethnic groups (Indian Health Service, n.d.; Sharma et al., 2009). The Indian Health Service (IHS) reported that in 2008, three out of every four (81%) NA adults aged 20-74 years are overweight or obese and one of every two (54%) NA adults are obese (Indian Health Service, n.d.). In terms of subgroups, NA women tend to have higher obesity prevalence than men and regional data shows that NA people have consistently higher rates compared to non-NA

people (Hutchinson & Shin, 2014). Obesity also disproportionally affects the youngest generation of NAs; NA youth experience the highest burden of any race or ethnic group in the US (Indian Health Service, n.d.). A recent analysis of the IHS National Data Warehouse from 2015 estimated that 18.5% of NA children aged 2-19 were overweight and 29.7% were obese; these rates were higher than the US children overall and were stable over the 2006-2015 period (Bullock, Sheff, Moore, & Manson, 2017). Representative obesity prevalence estimates are scant for Indigenous people of the US, due to the small sample size of NA participants (Bullock et al., 2017), the recruitment strategies used by national health surveys, and lack of regular reporting of anthropometry summary statistics in from the IHS user population. Improved surveillance and reporting of NA obesity prevalence are needed to monitor changes for this important health problem.

*2.2 **Burden of NCDs in Native communities***

The burden of childhood and adult obesity is of great concern due to the associated risk of developing NCDs later in life. There is mounting evidence that childhood obesity persists into adulthood (Brisbois, Farmer, & Mccargar, 2012; Singh, Mulder, Twisk, Mechelen, & Chinapaw, 2008) and is associated with the development of NCDs (Llewellyn, Simmonds, Owen, & Woolacott, 2015; Reilly & Kelly, 2011; Verbeeten, Elks, Daneman, & Ong, 2010), making obesity prevention efforts a key concern. The high mortality due to NCDs and the implications for future generations necessitate obesity prevention interventions in populations with high obesity burden. As of 2014, six of the top ten leading causes of deaths among NAs were attributable to obesity-related NCDs (Heron, 2016).

Among NA populations, type 2 diabetes and cardiovascular diseases have had large impacts. The Strong Heart Study (SHS) identified obesity as an important cardiovascular disease risk factor among NA and highlighted diabetes as a major contributor to coronary heart disease based on cohort of 45 to 74 year old adults from 13 NA communities in Arizona, Oklahoma, South Dakota, and North Dakota (B V Howard et al., 1995). SHS follow-up data indicated that NA participants had an almost twofold higher incidence of coronary heart disease incidence and higher mortality compared to those in the Atherosclerosis Risk in Communities study (Barbara V Howard et al., 2015). Decades of research from the Pima in Arizona and Mexico helped to establish the strong causal relationship between obesity and type 2 diabetes (Knowler, Pettitt, Savage, & Bennett, 1981; Schulz, 2016). A cohort study following Gila River Indian Community youth aged 5-19 years from 1965 to 2007 showed that children who were overweight ($\geq 85^{th}$ percentile) at baseline had increased risk of diabetes incidence in adulthood (Wheelock et al., 2016). The NA death rates from diabetes during 2007-2009 were 177 percent greater than the US general population in 2008 (Indian Health Service, 2014). Heart disease and diabetes rank in the ten leading causes of death for NA; the age-adjusted death rates from heart disease was equal to that of Non-Hispanic whites (NHW) while age-adjusted death rates for diabetes was over three times higher than NHW (Indian Health Service, 2014). NA also are more likely to experience high newborn birthweight (9.8% of NA have high birthweight compared to 2.2% in the US general population), which often accompanies gestational diabetes (Indian Health Service, 2014).

Native people with type 2 diabetes often experience more severe sequelae of the disease, compared to other ethnic groups (Naqshbandi, Harris, Esler, & Antwi-nsiah,

2008). The costs of diabetes treatment also constitute a large portion of the IHS services and treatment expenditures. In an analysis of IHS treatment costs in central Arizona for 2004 and 2005, O'Connell, et al. found that the costs of providing treatments to NA adults with diabetes were just over one-third of overall IHS treatment costs (O'Connell, Wilson, Manson, & Acton, 2012). Further, the average treatment costs for NA adults with diabetes was $7,682 on average per year, (3.6 times the cost of NA adults without diabetes), while the cost of adult diabetes in the general population was $10,700 on average per year (2.4 times the cost of adults without diabetes) (O'Connell et al., 2012). The annual costs of treating both diabetes and cardiovascular diseases were near twice the costs of treatment for adults with diabetes alone ($13,346 per year on average) (O'Connell et al., 2012). In an analysis of IHS funding in the central Arizona region, only 12 percent of participants reported having private health insurance (O'Connell et al., 2012).

*2.3 **Role of nutrition and physical activity in obesity***

Much of the obesity prevention and treatment research has attempted to influence individual-level factors including knowledge, attitudes, beliefs, and decision-making among individuals with high-risk behaviors (Cohen et al., 2000; Rose, 2001). Such an approach has key advantages, including its: opportunities for tailoring interventions for each individual, ability to enhance the motivation of both patients and healthcare staff, cost-effectiveness, and focus on providing services where there is the greatest need (Rose, 2001). On the other hand, the focus on high risk individuals also has some significant disadvantages, such as its: high cost, difficulty related to screening individuals, lack of focus on underlying causes of disease, and failure to recognize the

importance of behavioral contexts (e.g., the role of the family and community) (Rose, 2001). A key challenge of this research approach is demonstrating long-term success for sustained weight loss (Cohen et al., 2000). Most importantly, when interventions only target individual-level factors, they are unable to account for the important drivers of NA health status and inequality, including education, poverty, housing, access to health care, food insecurity as well as historical trauma (Communities et al., 2014; Hutchinson & Shin, 2014; Sotero & Vegas, 2006). Because of the importance of these underlying economic and social factors that are outside of individual control, obesity cannot be attributed to personal responsibility alone (Yach et al., 2006), and researchers and health promotion activities are increasingly promoting healthy environments to support obesity prevention and treatment programs.

In recognition of the importance of diet and physical activity, we provide a summary of what is known in terms of both dietary intake and physical activity levels of NA people. Little is known about physical activity levels of NA populations since there is little to no availability of national or regional data due to the lack of collaboration with Tribal Nations (Roanhorse, 2017). Based on a 2008-2009 survey of NA adults in Kansas, 45 percent of the sample reported exercising four or more days in the previous week (Berg et al., 2012). In the same survey, only 37 percent of the study sample reported eating at least 5 servings of fruit and vegetables per day (Berg et al., 2012). NA diets tend to be as high (Stang, Zephier, & Story, 2005) or higher in fat compared to the US general population (Ballew et al., 1997; Mayer-Davis et al., 2017; Stang et al., 2005). Based on adult intake data form 13 Tribes from the SHS (Phase II 1993-1995), carbohydrate and sodium intakes were higher and intake of vitamins A, C, and folate were lower compared

to dietary guidelines but were similar to the national averages found in NHANES, despite high prevalence of cardiovascular disease and diabetes in the SHS sample, signifying low intake of fortified whole grains, fruit, and vegetables (Stang et al., 2005). One possibility for these discrepant results is methodological since the dietary analysis software did not accurately account for traditional foods and recipes, seasonality of traditional foods and short data collection period, and exclusion of weekends – when most ceremonies and religious events are held (D Wiedman, 2005). An analysis from SHS Phase 1 (1988-1991) found that participants on average consumed a diet that was higher and fats and cholesterol compared to NHANES (Zephier et al., n.d.).

2.4 *Nutrition transition of NA communities*

NA communities have had traditional food systems that have provided healthy foods to sustain their people for millennia. Traditional food systems are defined as the food species that are available to a particular culture from local natural resources and their accepted patterns for their use within that culture (Kuhnlein & Receveur, 1996) and includes producer, consumer, and nutrition subsystems (Sobal, Khan, & Bisogni, 1998). Because of the emphasis on local natural resources, traditional food systems vary by tribe and location, but can include a combination of traditional agriculture (e.g., corn, beans, and squash), hunting (e.g., bison), gathering (e.g., wild rice, berries), fishing (e.g., salmon). Participation in traditional food systems also has implications for physical activity levels, since participation in this food system requires a high amount of physical activity (Compher, 2006b; Popkin, 2006; Story et al., 1998). There has been a documented worldwide nutrition transition from traditional food systems and diets to "Western diets" with more reliance on processed foods and diets that and higher intakes

of animal fats, hydrogenated fats, and lower intakes of fiber (Kuhnlein & Receveur, 1996; Popkin, 2006). These upstream causes of obesity and NCDs must be changed using structural interventions to prevent the development of obesity.

Kuhnlein outlines the causes and consequences of the decline of traditional food systems, including the reduced transfer of cultural knowledge to youth (Kuhnlein & Receveur, 1996). Food is central to cultural and religious activities for NA peoples (Kuhnlein & Receveur, 1996). For NA people, cultures and religions are based on interrelationships between people and the land, water, animals, and plants; for example, many ceremonies are focused on food gathering and harvesting and in the southwest, corn pollen is used for prayer. Practicing these religions was punished with arrest and jail time by the Bureau of Indian Affairs' Indian Agents until the American Indian Religious Freedom Act was enacted in 1978 (Dennis Wiedman, 2012). There are hundreds of years relevant history of Federal and State Policies Towards Native Nations, much of which has attacked Tribal rights to land and tribal cultures, which has great implications for traditional food systems (National Congress of American Indians, 2015).

Since we cannot feasibly provide a comprehensive review of the impact of all Federal and State policies toward Tribal Nations, we will highlight three policy drivers and their impact on traditional food systems. First, forced removal and relocation to reservations during the Removal period 1828-1887 meant that some tribes were either completely relocated or that their land bases were significantly reduced (Kuhnlein & Receveur, 1996; National Congress of American Indians, 2015). Some tribes could no longer participate in their traditional food systems since they were in completely different territories, while other tribes were not able to follow the seasonal availability of foods

(Kuhnlein & Receveur, 1996; Dennis Wiedman, 2012). Oftentimes, reservation lands had poor quality soil, making food scarce (Kuhnlein & Receveur, 1996; Dennis Wiedman, 2012). Second, Residential/Boarding Schools were established with the explicit purpose to "kill the Indian, and save the man", meaning remove culture from NA children (Churchill, 2004). Physical, sexual, and emotional abuse were rampant, and children were punished for speaking their languages (Churchill, 2004). NA children were forced to attend schools from the 1870s to the 1980s, often hundreds of miles away from their families, and so they could not participate in tribal food systems or learn from their families about this systems (Churchill, 2004). Third, the US government has provided foods to tribes for over 150 years through rations to address food insecurity and malnutrition in tribes (Byker Shanks, Smith, Ahmed, & Hunts, 2016; Dennis Wiedman, 2012). While they did address malnutrition issues, the foods that were provided were of low nutritional quality and were not culturally acceptable (Byker Shanks et al., 2016; Chino, Haff, & Dodge Francis, 2009; Dennis Wiedman, 2012). These food rations also introduced these problem of processed foods to these communities (Chino et al., 2009). A recent analysis has found that foods from the Food Distribution Program on Indian Reservations (FDPIR) (an alternative to SNAP for rural tribal communities) failed to adhere to federal dietary guidelines and provided insufficient amounts of fruit, vegetables, protein, and refined grains (Byker Shanks et al., 2016).

This history means that modern food systems for NA communities are complex and include traditional food systems, "Western" foods purchased from grocery and convenience stores, and food assistance programs (like FDPIR). NA communities are mostly rural and are located much farther from supermarkets compared to the general US

population (Kaufman, Dicken, & Williams, 2014a). A spatial analysis from 2010 revealed that 57.2 to 74.6% of tribal households do not have access to a vehicle and live more than 1 mile from a supermarket, compared to 20.1% of all US households (Kaufman et al., 2014a). NA communities tend to have many convenience stores, which do not commonly supply fresh produce and tend to stock prepared and fast foods (Gittelsohn & Sharma, 2009). Statistical analyses such as latent class analysis have the ability to make these complex environments and behavior intelligible and can suggest future interventions to promote healthy food environments; however, this methodology has yet to be used to understand NA environments in a wholistic way.

*2.5 **Structural obesity prevention strategies***

While there is limited evidence to support the long-term effectiveness of obesity prevention interventions targeting individual-level factors alone, there is growing recognition that support structural interventions are necessary to create lasting impact (Cohen et al., 2000). There is also a need for structural interventions that can effectively prevent and control obesity by promoting healthy food and physical activity access at upstream levels of influence, particularly in NA communities experiencing a high obesity burden (Yach et al., 2006). Unlike individual-based interventions, structural interventions to prevent obesity target entire populations to shift the population weight distribution (Cohen et al., 2000). Particularly in NA communities, where structural-level barriers to healthy eating and physical activity are pervasive, an approach targeting the community-level access can bolster other obesity prevention programs. The approach is also behaviorally appropriate, as it impacts behavioral norms instead of influencing individuals through health education alone (Rose, 2001). Though the population-based

approach has significant benefits, there are some potential drawbacks compared to the "high risk" intervention approach, including the modest benefit for individuals, reduced motivation of individuals, and decreased motivation of health staff to intervene (Rose, 2001). Reduction of the prevalence of an important risk factor, like obesity, can also have a very large impact on the number of disease cases and associated mortality in a population, even when the individual changes are modest (Ezzati & Riboli, 2012; Rose, 2001). Such an approach shifts the focus from individual behavior change and reduction of individual risk factors to a focus on addressing and/or considering upstream factors, like postcolonial oppression, historical traumas, food insecurity, racial inequality, income, urbanization, unemployment, in a population and a shift to a social determinants of health (SDOH) approach (Mitchell, 2012). These SDOH approaches to prevention have the potential to influence more people and for longer than individual interventions (Yen and Syme, 1999).

Interventions that promote structural changes include policy, systems, and environmental (PSE) changes to promote health at the population or community levels. PSE changes recognize the role of the broader community and institution on individual behaviors and have been used to promote healthy environments in these settings. Policy changes are laws, ordinances, and regulations within legislative or organizational levels to promote health (laws, ordinances, resolutions, regulations) (e.g., soda tax) (The Food Trust, 2012). Systems changes impact the connections between institutions/organizations that promote access (e.g., connections between local farms and school lunch programs) (The Food Trust, 2012). Finally, environmental changes happen to physical or social environments in which people live (e.g., increasing acceptance of limiting candy as

rewards in classrooms, incorporating sidewalks) (The Food Trust, 2012). Little previous research has, to our knowledge, examined PSE change processes that exist in federally-recognized tribes. To promote PSE changes in NA communities, interventions need to be grounded in existing mechanisms for creating these changes. Previous structural change interventions in NA communities

There have been few interventions aimed at developing structural change within NA communities. The American Indian Healthy Eating (AIHE) Project, worked with seven state-recognized NA Tribes in North Carolina to develop an approach using formative research and participatory methods to develop and implement tribally-led policy strategies to promote access to and consumption of healthy foods (Fleischhacker et al., 2012a). The project emphasized capacity building by providing support and technical assistance to Tribal governments (Fleischhacker et al., 2012a). The AIHE Project developed a toolkit providing tools and technical assistance on areas identified as having "the most potential to facilitate Tribally-led ways within the participating Tribes to improve access to health, affordable foods"(University of North Carolina at Chapel Hill, n.d.-b). Toolkits focused on disseminating best practices related to "Tribally owned and operated community gardens, Tribally owned and operated farmers' markets, healthy Pow Wow food and beverage options, healthy Tribal store, mobile & vending initiatives, and healthy families, healthy food activities" (University of North Carolina at Chapel Hill, n.d.-a).

*2.6 **Health policies enacted by Tribal Nations (TNs)***

Health policies are an important mechanism for achieving structural changes that have been used to successfully reduce smoking and alcohol rates by changing social norms and

expectations and by directly influencing behaviors (Cohen et al., 2000; Ezzati & Riboli, 2012; Pomeranz, 2014). Despite increasing interest in enacting obesity prevention and control policies at the Federal, State, and municipal jurisdiction levels, the scholarly literature related to enacting and promoting tribal health policies is underdeveloped. Use of health promotion policies is possible in federally-recognized NA Tribes because of their unique government-to-government relationship with the US (Fleischhacker et al., 2012a). This relationship provides federally-recognized Tribes with the right to self-government and entitlement to certain benefits and protections from the federal government, including health services (Fleischhacker et al., 2012a). The Tribal-US relationship was founded based on treaties between the US government and the majority of TNs which protected and ensured Tribal rights to self-rule in exchange for use of the land (Kalt & Singer, 2004). Those TNs that did not enter into treaties were protected by US doctrine to respect Tribal sovereignty (Kalt & Singer, 2004). Specifically related to obesity prevention, Tribal sovereignty offers federally-recognized Tribes the unique authority to implement universal prevention policies (McFarland, Gabriel, Bigelow, & Walker, 2006) that have yet to be fully explored with regards to obesity prevention (Fleischhacker et al., 2012a). In a recent review of more than 500 Tribal constitutions and government websites, the role of Tribal government in health has been acknowledged, yet little work has been done in NA settings to promote health policies for obesity and NCD prevention (Fleischhacker et al., 2012a).

Health policies are also beginning to be used as a tool for Tribal Governments to promote the health of their communities. One of the most comprehensive of these is the Healthy Dine' Nation Act, as it goes beyond taxing sugar-sweetened beverages by taxing

all food items with minimal-to-no nutritional value. The Healthy Dine' Nation Act was signed into law by President Ben Shelly in 2014 (Abasta, 2014). Beginning in April 2015, the Act imposed a 2% sales tax on "minimal-to-no nutritional value food items" sold on the reservation, including sugar-sweetened beverages and snacks high in salt, saturated fat and sugar (like sweets, chips, and crisps) (Abasta, 2014). Such a policy is the first of its kind enacted by a US Tribal Government (Landry, 2014). An estimated $1 million revenues (Clark, 2015) from the tax will be used to fund community wellness projects, like traditional cooking classes, farming, and farmer's markets (Abasta, 2014). This is the first junk food tax in the US, though there are other sugar-sweetened beverage taxes enacted —in Berkeley, California and Philadelphia, PA, to name a few (Clark, 2015).

One of the first examples of Tribal Nation food policies came about in 1996 when the Gila River Indian Community also enacted its Tribal Food Policy (Mitchell, 2012). This food policy focused on promoting healthy options – traditional foods in particular - instead of restricting access to unhealthy foods (Mitchell, 2012). Reminders of the policy were also distributed throughout the community during feast times, such as holidays and tribal gatherings (Mitchell, 2012). This policy required that healthy food options be available at all Tribally owned/operated locations and functions planned or sponsored by Tribal employees, emphasizes foods low in fat, sugar, sodium, and calories, healthy food choices are identified using a logo featuring Pima maize, encourages traditional foods meeting dietary guidelines. Vending machines must also offer at least one healthy food option that meets US dietary guidelines for every food category in the vending machine. Caterers who can demonstrate adherence will be given preference for services (Mitchell,

2012). These projects demonstrate that policy-based intervention strategies are feasible and of interest to Tribal Leaders. However, more research is needed to understand how to develop PSE changes in NA communities.

*2.7 **Multilevel, multicomponent obesity intervention strategies***

Multi-level, multi-component (MLMC) approaches present an opportunity to combine the complementary strengths of both individual-centered "high risk" intervention strategy along with the population-centered public health approach to promote structural changes (Rose, 2001). These approaches also balance the ethical need to provide education with the need to provide population-level impacts (Rose, 2001). Incorporating structural change interventions increases the chances that these interventions will be sustained for the effort, as they require less one-on-one individual counseling (Frieden, 2010; Rose, 2001). Instead of designing an intervention that targets only individual-level or structural change, some interventions combine both of these strategies to work on multiple levels and incorporate multiple components. This intervention strategy has been shown to be successful in ameliorating diabetes and obesity-related risk factors by complementing and reinforcing intervention activities in other components and achieving high exposure to the intervention (Gittelsohn & Rowan, 2011). These multilevel intervention strategies also enhance the sustainability, ownership, and capacity of intervention activities when these activities engaged community partners throughout the intervention activities (Gittelsohn & Rowan, 2011). Two prominent examples of such interventions include Healthy Children, Strong Families and OPREVENT1 studies. The Healthy Children, Strong Families project is an intervention working at the household and community levels to improve healthy eating and physical activity of children aged 2 to 5 years and

their families in three NA communities in Wisconsin (Communities et al., 2014). The Supportive Community component worked in each community to develop community advisory boards (CABs) that met monthly to identify and address environmental barriers to healthy eating and physical activity (Communities et al., 2014). CAB membership was open to all interested in participating and included community members, academics, and tribal partner stakeholders and was coordinated by an academic, non-NA facilitator (Communities et al., 2014). CABs worked in an iterative process to identify relevant supports and barriers using a three-step process: prioritize barriers and review potential interventions; gather data and expert opinions; and develop actions to address barriers (Communities et al., 2014). This intervention component led to high attendance by community members (19 per meeting on average) and decreased the number of environmental barriers to healthy eating and physical community in each community (Communities et al., 2014).

The OPREVENT1 program was an MLMC obesity prevention intervention to improve access to healthy foods and opportunities for physical activity (Redmond, 2017). Five NA communities in the Midwest and Southwest were randomly selected to receive either Round 1 (i.e., Intervention) or Round 2 (i.e., Delayed Intervention, Control) of the intervention. Data collection occurred immediately before and after Round 1 of the OPREVENT intervention. Intervention activities were conducted over a 14-month period in local stores, schools, worksites, and community media and organized into six phases, each highlighting different key messages, promoted foods, target behaviors, visual materials, and other site-specific activities. Preliminary impact results indicate that intervention respondents had a significantly reduced waist circumference compared to

participants from Round 2 communities (p=0.046). Individuals with high levels of exposure to the intervention also had a greater decrease in waist circumference compared to those with low exposure. Change in waist circumference was significantly associated with a change in percent body fat, indicating a reduction in central adiposity. Male participants from Round 1 intervention communities had a BMI decrease of 1.5 kg/m^2. Sustaining such community-based interventions is particularly important for obesity and chronic disease prevention since behavior change takes time, requiring support and reinforcement from the environment (Shediac-Rizkallah & Bone, 1998). However, and to our knowledge, there has been no research examining community stakeholder perspectives of strategies for and barriers to promoting obesity prevention program sustainability in NA communities.

*2.8 **Limitations of previous research***

This previous work has several limitations which this proposal intends to address. First, despite increasing interest in enacting obesity prevention and control policies at the federal, state, and municipal jurisdictions, the scholarly literature focusing on promoting tribal PSE change is comparatively underdeveloped. Little previous research has, to our knowledge, examined PSE change processes that exist in federally-recognized tribes. To promote PSE changes in NA communities, interventions need to be grounded in existing mechanisms for creating these changes. Second, statistical analyses such as latent class analysis have the ability to make these complex environments and behavior intelligible and can suggest future interventions to promote healthy food environments; however, this methodology has yet to be used to understand NA environments in a wholistic way. Use of baseline data to describe community environments presents a novel analysis approach

that can be used as a tool to engage with community stakeholders to develop community-specific structural interventions. Third, to our knowledge, there has been no research examining community stakeholder perspectives of strategies for and barriers to promoting obesity prevention program sustainability in NA communities. Describing factors related to sustaining MLMC obesity prevention programs can assist in developing strategies to ensure that program benefits extend beyond the study period.

The proposed study will facilitate the development of an intervention component which will work with community stakeholders to develop structural changes as part of OPREVENT2, an MLMC obesity prevention program to be implemented in six NA communities in the Midwest and Southwest. This new component aims to support the sustainability of OPREVENT2 activities and work with communities to develop structural interventions to improve the food and physical activity environments that are of interest to tribal stakeholders.

2.9 Summary

The burden of obesity has not been evenly distributed, with NA populations experiencing far higher burdens than the national population as a whole (Indian Health Service, 2008). This increase in obesity has been proceeded by a transition from traditional food systems to "Western diets" that are characterized by processed foods that are high in animal fats, and lower in fiber (Kuhnlein & Receveur, 1996; Popkin, 2006). The rise in obesity is important because of the associated increase in NCD risk later in life. Despite the emphasis on individual-level causes of related to obesity prevention and treatment research, such a focus is inappropriate for NA populations, who have a unique history of oppression which continues to influence the health inequity of this population.

Interventions working at multiple levels to influence both upstream and downstream factors are beginning to be implemented in partnership with NA populations and have shown promise for empowering NA people to develop positive food and physical activity environments. Though there is increasing interest in structural interventions for obesity and NCD prevention, there is comparatively little research to understand how to develop structural changes in NA communities.

Chapter 3. Methods

This dissertation research was conducted as part of the formative and baseline data collection stages of OPREVENT2, a five-year MLMC obesity prevention trial with six NA communities in the Midwest and Southwest. The goal of the formative research stage was to develop intervention strategies promoting improvements to the food and physical activity environments that would work with our partnering communities, while the baseline data collection gathered behavioral, psychosocial, sociodemographic, and anthropometric data from randomly selected participants from each community. This chapter describes the data collection phases, the OPREVENT2 parent study, background and funding, OPREVENT2 theoretical framework, selection of communities, study settings, study timeline, data collection training, data management, data management, and ethical approval for this dissertation research.

This study employed formative research methods to develop a policy-based intervention component for the OPREVENT2 intervention. Formative research uses qualitative and/or quantitative data collection methods to provide information regarding environment, context, culture, resources, and intervention strategies that will inform intervention development or implementation (Bentley et al., 2014; Gittelsohn et al., 1999, 2006). We interviewed community stakeholders in three Native communities participating in OPREVENT2 to develop a conceptual framework describing the process for making environmental changes using a modified Grounded Theory methodology (Paper 1). This conceptual framework aided in the development of the OPREVENT2 Community Action Component, which is working with community partners to promote access to healthy foods and physical activity resources. We also conducted interviews

with community stakeholders to understand their perspectives on the sustainability of the OPREVENT2 program (Paper 3). Analysis of baseline data allowed us to identify potential structural changes in partnership with community stakeholders (Paper 2). Taken together, the results of this research were used to develop a theoretically-based approach to develop obesity prevention policies and structural changes in partnership with tribal stakeholders.

3.1 Data Collection Phases

Data were collected as part of the formative research and baseline data collection of the OPREVENT2 project. The goals of this formative research were to identify strategies to support a new intervention component that could: facilitate the development of structural changes promoting healthy eating and active living and identify strategies to promote the long-term sustainability of the OPREVENT2 program. Data were collected in three phases: 1) qualitative data collection and pilot intervention with one pilot community; 2) qualitative data collection with OPREVENT2 Round 1 communities; and 3) quantitative OPREVENT2 baseline data collection. Phase 1 of data collection used in-depth interviews, unstructured participant observations, and modified talking circles. In Phase 2 of data collection, workshops and in-depth interviews with OPREVENT2 Round 1 communities were conducted. Phase 3 of data collection included Adult Impact Questionnaires administered as part of the baseline impact assessment for the OPREVENT2 trial.

3.2 Parent Study

OPREVENT2 - Obesity Prevention Research and Evaluation of interVention Effectiveness in NaTive North Americans 2 - is an MLMC obesity prevention program in six Native communities in the Midwest and Southwest to improve nutrition, increase physical activity, reduce adiposity, improve psychosocial measures, and improve structural community factors. To achieve these goals, the OPREVENT2 intervention includes five reinforcing programmatic components working in food stores, worksites, schools, mass media, and policy realms. The yearlong intervention is being delivered over six intervention phases beginning in May 2017, each promoting specific foods and behaviors over the course of two to three-month period per phase. This study utilizes a cluster-randomized controlled trial design to evaluate the impact of the intervention components in food stores, worksites, schools, mass media, and community action (Gittelsohn et al., 2017a).

3.3 Background and Funding

Prior to OPREVENT2, a pilot study called OPREVENT1 was conducted to reduce adiposity among five Native communities in the Midwest and Southwest (Gittelsohn et al., 2017a). OPREVENT1 was originally planned as a community-randomized controlled trial and power calculations were conducted based on six participating communities, with three randomly-selected communities receiving the intervention first (Round 1 Intervention) and three receiving the intervention following post-intervention impact assessments (Round 2, Delayed Intervention) (Redmond, 2017). Because one community declined to participate, OPREVENT1 used a quasi-experimental evaluation design to assess the impact of a 14-month intervention working in local food stores, worksites,

schools, and community media (Gittelsohn et al., 2017a; Redmond, 2017). Two Round 2 communities were included in the OPREVENT2 pilot to: deliver obesity prevention programs to these communities and test strategies for community engagement activities for the planned Community Action Component. One of these communities, Community A, also took part in the formative research data collection for OPREVENT2.

The impact of OPREVENT1 was modest, with no difference in psychosocial variables (i.e., knowledge, self-efficacy, and intentions), physical activity behaviors, or BMI and small impacts on diet and psychosocial variables comparing Round 1 (i.e., Intervention) and Round 2 (i.e., Delayed Intervention, control) communities (Redmond, 2017). However, there was a large shift from sedentary to moderately active categories among participants from Round 1 intervention communities (Redmond, 2017). There was also a significant decrease in sugar-sweetened beverage consumption in Round 1 (Immediate) Intervention communities compared to Round 2 (Delayed Intervention) (Redmond, 2017). Overall exposure to the OPREVENT2 intervention was low and likely contributed to the modest impacts (Redmond, 2017). Lessons learned from the OPREVENT1 program include the need for both increased intensity and individual exposure of intervention and increased attention to policy-based interventions (Gittelsohn et al., 2017a; Redmond, 2017). Following the OPREVENT1 program, a grant was written to expand the intervention work in stores, worksites, schools, and media by adding a component to promote obesity prevention policies to improve the food and physical activity environments and to enhance the long-term sustainability of the overall intervention. Funding for this research and the OPREVENT2 study was provided by the National Heart, Lung, and Blood Institute (R01HL122150; J.Gittelsohn).

3.4 Theoretical Framework

The OPREVENT2 study used several existing behavior change theories to inform its intervention, including the Social Cognitive Theory and the Social Ecological Model. Historical Trauma Theory was also utilized in this research, as it provides an important theoretical perspective for understanding and contextualizing Indigenous health inequalities. These theories will be described in the following sections and followed by the conceptual framework of the OPREVENT2 intervention.

3.3.1 Social Cognitive Theory (SCT).

SCT was developed by Bandura in 1986 and described a dynamic relationship between individual factors, environmental factors, and individual behavior (Bandura, 2002, 2004). According to this theory, five factors are central in determining motivation and behavior, including knowledge, self-efficacy, outcome expectations, goals, as well as perceived facilitators and barriers (Bandura, 2004). Bandura's construct of self-efficacy was conceived as a foundational aspect of human agency (Bandura, 2001) and can be defined as the "conviction" that a person can successfully perform a particular behavior to achieve a desired outcome (Janz, Champion, & Strecher, 2002). A person's self-efficacy is relevant in motivating individual actions by influencing the goals that are chosen, determining the amount of effort and time to put forward to achieve the goal, and interpreting successes and failures as motivating or unmotivating (Bandura, 2001). Self-efficacy has been shown to be particularly useful in understanding behaviors that are more complicated or sustained, so much so that the construct has been added to individual-level behavior change theories (Janz et al., 2002). This model and the

construct of self-efficacy have been used extensively in health research to understand the multiple levels of influence related to healthy eating and physical activity behaviors.

3.3.2 Social Ecological Model (SEM)

The SEM recognized the roles of both individuals and their environments in influencing behaviors (Cohen et al., 2000). McLeroy differentiated five levels of factors, including intrapersonal, interpersonal, organizational, community, and public policy levels (McLeroy, Bibeau, Steckler, & Glanz, 1988). Structural interventions aim to modify health-related behaviors by changing factors external to the control of the individual (Cohen et al., 2000) and therefore focus activities on upstream levels beyond the intrapersonal level. The goal of such interventions is to change health-related behaviors of the entire population rather than to focus on individuals with high-risk behaviors (Cohen et al., 2000; Rose, 2001). Cohen et al. identified four categories of modifiable structural factors which directly and indirectly influence individual behaviors, including the availability of protective or harmful products, physical structures and characteristics, social structures, and media messages (Cohen et al., 2000). This model has been used increasingly to examine and influence health-related behaviors in public health, particularly for understanding and preventing obesity.

3.3.3 Historical Trauma Theory

Historical trauma is akin to individual level trauma, but is experienced as a result of trauma at the collective or group level (e.g., colonialism, slavery, war) and can be experienced even generations after the traumatic event (Duran, 2006; Sotero & Vegas, 2006). Historical trauma has been defined as, “cumulative emotional and psychological

wounding across generations, which emanates from massive trauma" (Denham, 2008) and is also referred to as "intergenerational trauma", "soul wound", and "collective unresolved grief" in the literature (Walls & Whitbeck, 2012). Historical Trauma Theory looks more broadly at the concept of historical trauma by connecting it to higher prevalences of disease and thus health inequity in populations that have experienced historical trauma (Sotero & Vegas, 2006).

Although generally not recognized in the literature, this theory has implicit origins in Marxist or critical theory (Sotero & Vegas, 2006). In particular, this theory highlights the domination and exploitation of colonialist populations over Indigenous people (Cockerham, 2007). While social control and maintenance of the status quo are possible using many methods (e.g., brute force, colonialism, genocidal policies), it is powerfully enforced using structural violence. Galtung described structural violence as a kind of indirect violence, where there is not a clear subject who acts on another (Galtung, 1969). He emphasized that this kind of violence leads to real consequences, allowing groups of people to be marginalized and suffer more than they otherwise would (Galtung, 1969). Structural violence is not a characteristic of the intrapersonal level but is a phenomenon of society, in which both resources and power to distribute these resources are themselves unevenly distributed (Galtung, 1969). It is in these indirect and pernicious ways that historical trauma is inflamed and exacerbated since exploited populations not only experienced the original trauma, but this collective trauma placed these populations in a position of systematically undermined power and resources.

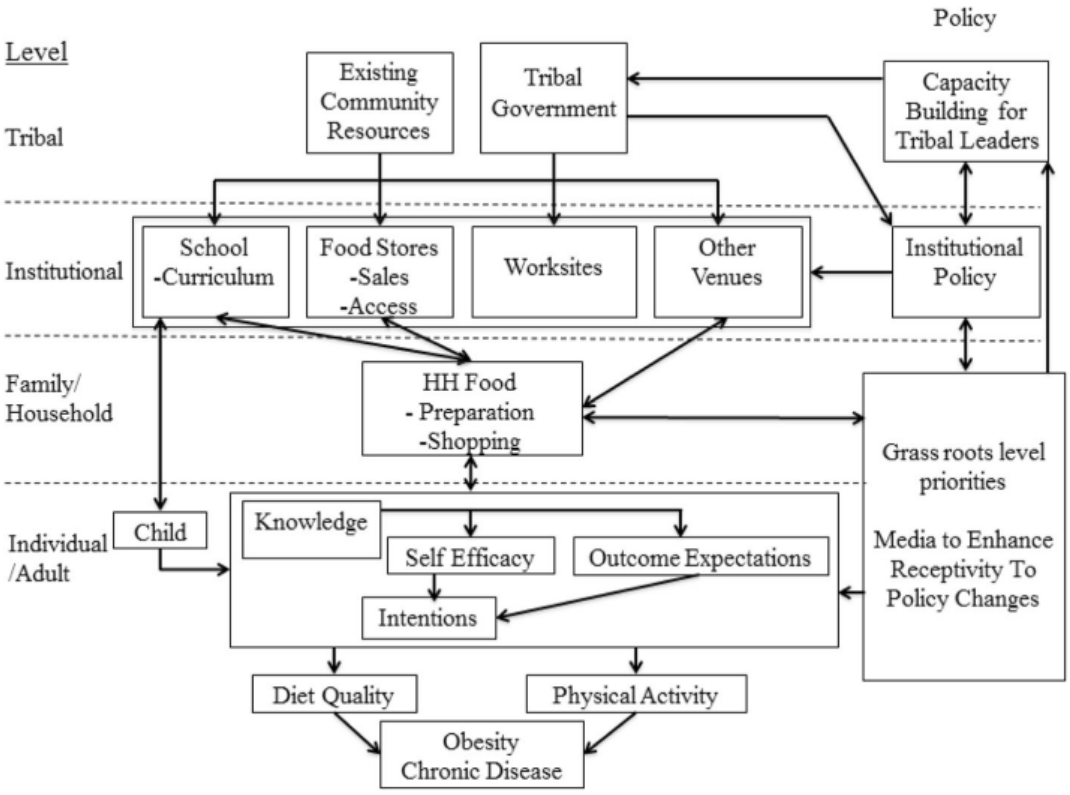

Figure 1. OPREVENT2 Conceptual Framework

The OPREVENT2 conceptual framework for intervention and evaluation is shown in Figure 1 (Gittelsohn et al., 2017a). This framework was based on SCT and SEM, and so the OPREVENT2 intervention addresses multiple levels of influence to influence individual behaviors. Multiple intervention components simultaneously engage institutions throughout the community (e.g., schools, food stores, worksites) and address risk factors at multiple levels of the SEM, including the Tribal/community, institutional, household/family, and individual levels. The simultaneous interventions in schools, worksites, and food stores aim to increase access to healthy foods while promoting those options using promotional materials (e.g., posters, booklets) as well as one-on-one nutrition education sessions (e.g., taste tests, cooking demonstrations). The media component to promote awareness of OPREVENT2 programs and messages, using local

radio and newspaper announcements and social media daily posts. The policy-based intervention, called "Community Action Component", works at Tribal and institutional levels to develop structural changes by holding monthly coalitions meetings in partnership with community stakeholders (including Tribal Representatives, government staff, health staff, school employees, store owners/managers). Monthly coalition meetings focus on developing priorities for action, providing structural change recommendations based on previous research, and developing a policy package for the community based on local discussions. Community-based participatory methods are being used to engage with community stakeholders. Opportunities for capacity building are also potential topics for coalition meetings, based on discussions at each site. This conceptual framework, as it was first developed, had some key gaps in our understanding: how to promote structural changes in NA communities, what stakeholders should we engage, and what is the best forum for our program and for making environmental change. Strategies for promoting environmental change and promoting sustainability have been developed based on the results of papers 1 and 3, while potential PSE changes for NA communities have been described in Paper 2.

3.5 Selection of Communities

For the OPREVENT2 study, eight NA communities from the Midwest and Southwest participated: three from the Midwest Region and five from the Southwest Region. These eight communities included six main trial communities (two from the Midwest and four from the Southwest) and two pilot communities (one from each region, formerly OPREVENT1 Round 2 communities) (See Table 1).

Pilot communities were included for practical and methodological reasons. Practically, the pilot communities participated in OPREVENT1 and were randomly selected to receive Round 2 (i.e., delayed) of the intervention beginning in September 2015. These pilot communities received the OPREVENT1 intervention as well as a pilot of the Community Action Component Activities. The pilot community from the Midwest additionally participated in formative research data collection between. This community was selected because of the similarity of its governance structure, culture, and history to other communities in its region. Additional data were collected with two OPREVENT2 Round 1 communities (one in the Southwest and one in the Midwest) to additionally expand our preliminary results and increase generalizability to other communities.

To be eligible for the OPREVENT2 main intervention (i.e., Main Trial communities), NA communities were required to have at least 500 people living on-reservation and have at least: one school, one food store, and one worksite on-reservation. Initially, 37 Native communities in the Southwest (n=27) and Midwest (n=10) regions were approached to participate in OPREVENT2 during the grant application process. In these initial contacts, community representatives were provided with information about the proposed research project and an invitation for their communities to participate. We held one in-person informational meeting in each region and invited representatives from each community to attend. Community representatives from 12 communities from the Southwest and seven communities from Midwest attended the meeting and expressed interest in participating in the project. For the original grant application, seven communities from the Southwest and four communities from Midwest provided Tribal Resolutions approving the project in their communities. Once the funding was received,

four communities in the Southwest and two communities in the Midwest remained interested in participating. Several communities declined to participate in OPREVENT2 because they received funding for similar chronic disease prevention programs and they felt they could not do this in addition to OPREVENT2. Main trial communities were randomly assigned by region to receive either Round 1 (i.e., Immediate Intervention) or Round 2 (i.e., Delayed Intervention) of the intervention in December 2016. Data collected from the OPREVENT2 pilot community was used in the analyses for Papers 1 and 3. Data from a subset of OPREVENT2 main trial communities was used for Papers 1, 2, and 3.

This dissertation used data from the formative research stage as well as baseline data from the OPREVENT2 main study to enhance our understanding of strategies for promoting structural changes in Native communities. The qualitative data were collected from a subset of the OPREVENT2 participating communities (one pilot and two Round 1 communities) to develop intervention strategies for a Community Action Component that would complement the existing programs developed for food stores, worksites, schools, and mass media. OPREVENT2 baseline impact data from three main trial communities (one from the Southwest; two from the Midwest) were used for quantitative exploratory analysis of community environments.

3.6 Study Setting

The following section provides a brief description of the communities that participated in formative research and the papers of this dissertation. In keeping with the agreements with between the study team and each community, community names will not be used in

their description to maintain participant as well as community confidentiality. Table 2 provides an overview of each community and its characteristics.

3.6.1 Community A [Pilot Community]

Community A (called Community 1 in Papers 1 and 2) is an Anishinaabe community in the Midwest region of the US. Tribal members of Community A are descendants of the Anishinaabe people who migrated to the Great Lakes region from the East coast shores of North America. The migration westward was brought about by one of the Seven Prophecies, warning the people of a coming danger and that they should head west until they found food that grew on water. When the Anishinaabe people reached the Strait of Mackinac, an area connecting the Great Lakes of Michigan and Huron, the Anishinaabe separated into their separate Tribes, with subtribes heading into different areas of the Midwest Region. Though these subtribes are connected by kinship, language, and culture, they do not have a unifying political structure between them.

Tribal members are descendants of the first peoples who refused to leave the area during the Trail of Tears forced by the Indian Removal Act. As a result of biological warfare, most of the community's families were lost, leaving only about 10% of the families which became the primary families of the current Tribe. There are currently about 1500 community members living on or near the reservation.

Community A is governed by the Tribal Council and alternate Tribal Councilmembers. The Tribal Council is responsible for oversight of community operation, including establishing laws and ordinances, policies, and procedures. Tribal Councilmembers are elected by tribal members. The Council holds monthly business meetings and also holds open meetings to hear community concerns every month.

In terms of the food and physical activity environments, it is notable that the community has several important resources available to the community. The community has a small, one-room fitness center at the health center, a fitness center and wellness program for Tribal employees, Pow Wow grounds, and several walking paths in the community. There is one small convenience store located in the community, which is attached to a gas station. Also, there are small prepared food outlets that sell fast foods near the gas station. The casino also has several restaurants, including a grill, a fast food restaurant, a sit-down restaurant, and a café.

3.6.2 Community B [Round 1 community in Midwest Region]

Community B (called Community 2 in Papers 1 and 2) consists of five sub-communities that are spread across several counties in the Midwest. Population size is approximately 1500. The Tribe has lived in this area for hundreds of years, though they migrated from their original homelands on the Eastern Atlantic, similarly to Community A. Tribal ancestors of Community B and others found wild rice in their current land area and established settlements having found this sacred food.

The traditional Ojibwa lifestyle was semi-nomadic, as the villages moved by season to follow food sources that changed with the seasons: moving into smaller woods-based camps in the winter, to the sugar camps in the spring, and larger villages in the summer. Ancestors of the Tribe, along with other Native people in the region, participated in the fur trade with the French, trading fur pelts for goods like kettles. After the French left the region, and in the absence of the fur trade, the Tribe moved to their current land area, where there was an abundance of resources. As a result of the Indian Reorganization Act, hereditary chiefs were no longer allowed to govern the Tribe and established Tribal

Councils as the governing bodies. The Tribal Council consists of several elected Tribal Councilmembers, including a Chairperson, Vice Chair, Secretary, and Treasurer Positions.

The community has several resources to promote physical activity, including an exercise club, summer camp, and a 24-hour fitness center located at the health clinic. The Tribe also has a grocery store, selling traditional foods, and a convenience store/gas station that predominantly sells snack foods and beverages. There are also many stores located nearby the community (approximately four convenience stores and three grocery stores). The Tribe also has gaming facilities with several locations. These gaming facilities also have food vendors located on-site, including three dine-in restaurants, two buffets, two delis, and a convenience store. There are two schools in the community, one on-reservation and one off-reservation, in nearby towns.

3.6.3 Community C [Round 2 community in Midwest]

Community C is an Anishinaabe community located in the Midwest Region and has approximately 2,000 people living on-reservation. Like the other Anishinaabe communities in the region, Community C tribal ancestors migrated to the region from the East Coast. They similarly had a semi-nomadic lifestyle and place much cultural value in wild rice, tobacco, and birch trees. The community is governed by an elected Governing Board. Monthly Tribal Council meetings are open to community members.

. The Allotment Act forced individual ownership of land, which enabled land speculators to manipulate Native people into selling their lands, resulting in a checkerboard pattern of land ownership. Following this legislation, the Indian Reorganization Act was partly an admission of the injustice of the allotment policy and

instead promoted tribal self-sufficiency and self-government through the establishment of Tribal Constitutions and Tribal Councils.

The community has grounds where it holds annual Pow Wows. The community also has a local post-secondary education facility, two elementary schools, one on the community and one outside the community, and one Head Start facility. There are four small food stores and two large food stores. This community was randomly selected to receive Round 2 of the OPREVENT2 intervention; thus, it did not participate in formative research but participated in baseline interviews at the household and institutional levels.

3.6.4 Community D [Round 1 community in the Southwest]

Community D (called Community 3 in Papers 1 and 2) is located in the Southwest Region and consists of approximately 3,000 people. The Tribe is part of the Athabascan language family, with linguistic relatives in the Pacific Northwest Region of the US and Canada. According to linguistic anthropologists, various Athabascan tribal peoples arrived in the Southwest estimated to be between 1300 and 1500 AD. The migration of people is also described in the Tribe's origin story, moving to their current sacred territory. Archeological evidence also suggests that the people were originally nomadic and hunter-gatherers and brought sinew-backed bow with them from the north. The Tribe adapted considerably to the Southwest and Plains, by adopting some ceremonial and agricultural practices from the other tribes in the region. After the Athabascan peoples split following their arrival in the Southwest, ancestors of Community D maintained their nomadic, hunter-gatherer lifestyle. Adoption of cultural practices from other Indigenous groups helped ancestors of Community D adapt to both the local terrain of their territory.

The Indian Reorganization Act of 1934 intended to reverse the previous impacts of the Dawes Act, which settled Native Americans on individual land plots and allowed non-Natives to purchase Native lands, forcing individual ownership and creating poverty across Native America. The Indian Reorganization Act also laid the foundation for modern Tribal Governments and promoted Tribal authority and responsibility of their affairs, by allowing Tribes to establish a constitution, corporate charter, and bylaws. The Tribe is governed by an elected Tribal Council.

In terms of food outlets, the community has a large, Tribally-owned grocery store, two smaller convenience/gas station stores, and a Family Dollar. Although this community has a grocery store and several smaller stores, tribal members commonly drive 30-50 minutes to nearby towns for food purchases. Like other reservations, the USDA commodities (through the Food Distribution Program on Indian Reservations) are provided to this Tribe by monthly distributions based on need. There are four local restaurants and informal food vendors in the community, including a sit-down restaurant located in the casino, a hamburger grill, Chinese restaurant, Mexican restaurant, and local burrito peddlers. Tribal members are also able to hunt and fish for local traditional foods. The community has several facilities available for physical activity, including a fitness center with exercise and weightlifting equipment and a community center with a basketball court and swimming pool. Community D has an elementary, middle, and high school located on-reservation with a gymnasium, football, and track field.

3.7 Study Timeline

Data for this dissertation were collected over the course of approximately 2.5 years starting in August 2015. Qualitative data for papers 1 and 2 were collected in two phases:

the first phase of data collection was conducted with one pilot community in the Midwest, “Community A”, over the course of one year. Phase two was conducted with three main trial communities, “Community B”, “Community C”, and “Community D” over approximately 18 months (see Table 3). OPREVENT2 baseline data were collected between September 2016 and May 2017. Baseline data collection (Phase three of data collection) consisted of a Food Frequency Questionnaire and Adult Impact Questionnaire.

3.8 Data Collection Training

Qualitative data collection. During my fieldwork, I collected the majority of qualitative data, including all in-depth interviews from Community A and five in-depth interviews from Community D, modified talking circle in Community A, observations Community A, and workshops in Communities B and D. Additionally, seven in-depth interviews were conducted by a master’s student who was assisting in OPREVENT2 intervention implementation in Community D, and four in-depth interviews were conducted by the PI of the study during a field site visit in Community B. Prior to additional in-depth interviews by student researcher and the study PI, I provided a 90-minute training to prepare both interviewers for additional in-depth interviews in Communities B and D. Training included a review of interview procedures and in-depth interview guides, data collected, emerging themes, and a table covering additional research gaps and corresponding interview questions.

Quantitative data collection. OPREVENT2 data collectors received a weeklong training and certification to perform all aspects of the baseline individual impact interviews in the summer of 2016. Data collection training was provided by a doctoral student working on

the project and the data manager for the study. Four of the seven OPREVENT2 data collectors are highly experienced data collectors, with over 40 years of combined experience conducting research in Native communities. Data collection training included an overview of the instrument and each section of the data collection forms as well as opportunities to practice conducting interviews among pairs of data collectors, with feedback provided by trainers.

3.9 Data Management

During my fieldwork, I managed and led the qualitative data collection. Field notes were written in a password-protected encrypted file. Interview participant contact information, dates, and length were also managed using in a password-protected encrypted file. All transcripts were de-identified before uploading to analysis software. For interviews with participants who did not want to audio record, verbatim notes were taken on a laptop and expanded afterward. After these interviews, additional dialogue that was missed in the notes were added and these additions were denoted with parentheses to retain a distinction between the verbatim notes and the expanded notes.

OPREVENT2 baseline data collection were managed by the study data manager, Lisa Poirier. Data management included checking through completed forms to ensure that forms were complete and working with data collectors to clarify any missing or ambiguous entries. Data from the Adult Impact Questionnaire were then entered and cleaned by the data manager and research assistants into a Microsoft® Access® (Microsoft Corporation, 2016) database. To limit data entry error, the database utilized validation rules and required responses for all questionnaire items. Data were cleaned by double checking extreme numerical values for food getting (greater than 15), height,

weight, age, number of people in the household, number of children in the household. Values were either confirmed or revised if they were a data entry error. Measures with only one height (n=1) or one weight (n=1) measurement were excluded since they did not have the same level of precision as other participants (n=2).

3.10 Data Analysis

Here we provide a description of the analysis methods used for each paper.

Paper 1 (processes for developing PSE change): Grounded Theory is an analysis methodology that develops codes and relationships between codes based on qualitative data (Charmaz, 2006). Use of this methodology can assist in the development of a conceptual framework that is "grounded" in the local descriptions of processes of interest (Charmaz, 2006). By following the Grounded Theory coding strategies, codes are first identified and developed through line-by-line coding a small subset of informative transcripts (Charmaz, 2006). These initial codes are refined, organized, and collapsed to focus on a specific research question of interest and become focused codes (Charmaz, 2006). These focused codes then become the structure for a codebook that would be used to code all qualitative data. Axial and theoretical coding stages then begin to form relationships within and between codes to develop a conceptual framework (Charmaz, 2006).

We used a modified Grounded Theory coding process, which included initial coding, focused coding, axial coding, and memoing strategies (Charmaz, 2006). Initial coding was used to code line-by-line and incident-by incident (Charmaz, 2006). Initial coding was conducted using five transcripts that provided an overview of the

environmental change processes from various perspectives from Community 1. In vivo codes and gerunds were used to stay close to the data as well as the processes being described (Charmaz, 2006). These initial codes were then pared down to focused codes after duplicates/similar codes were collapsed, which by that point were more closely related to the research question and would become the primary analytic categories of a codebook. This codebook of focused codes was used to code the remaining in-depth interview and workshop transcripts, allowing for flexibility for new codes (Charmaz, 2006). Lastly, axial coding was used to understand the dimensions of each focused code and to develop subcodes and relationships with the larger codes. Data analysis included the use of memo writing to reflect on the researcher's role in shaping the research, create definitions for codes and making connections between codes (Charmaz, 2006). Theoretical sampling was used to reach a saturated description of themes emerging from the data and inform additional data collection (Charmaz, 2006). Dedoose analysis software version 8.0.42 was used for coding and memoing ("Dedoose," 2016).

Paper 2 (identifying household and community food and physical activity environments):

Latent class analysis (LCA) is a data-driven approach to identify underlying subgroups ("classes") of which an overall population is comprised based on patterns of responses to a set of correlated dichotomous indicator variables (McCutcheon, 1987). LCA uses maximum likelihood estimation to obtain the following parameter estimates: latent class probabilities (i.e., the prevalence of each subgroup/class in the sample) and conditional probabilities for each indicator given class membership (i.e., the probability of indicator responses within each class) (McCutcheon, 1987). These two types of parameters can be combined to compute "posterior" probabilities of belonging to each class given one's

observed pattern of responses (McCutcheon, 1987). LCA models assume conditional independence of indicators within classes—that is, homogeneous reporting up to uncorrelated measurement error—as well as independence of observations (McCutcheon, 1987).

To implement the analysis, a first step was to dichotomize household food getting variables based on if respondents had never gotten (0 times per month) or ever gotten (at least once per month) each food item. For foods that were purchased more frequently (i.e., the frequency of never getting the food item was less than 10% for the previous month), variables were dichotomized into categories for weekly (0-4 times per month) and more than weekly (5 or more times per month), which was done for fresh fruit, fresh vegetables, canned vegetables, poultry, and water items.

Next, exploratory LCA was conducted to identify the appropriate number of classes by comparing the 1-, 2-, 3-, and 4-class models that used a subset of six indicators for each latent variable. Here, we aimed to avoid gross overfitting by limiting the analysis to six indicators (See Table 6 for a list of indicators used for exploratory LCA). For each latent variable, the number of classes was chosen based on a combination of model fit statistics, including Bayesian information criterion (BIC), Lo-Mendell-Rubin (LMR), bootstrap likelihood ratio test (BLRT) (Nylund et al., 2007), the number of extreme standardized residuals (>1.96 or <-1.96), and model precision (based on size of standard errors of indicator probability estimates). For interpretation of the model fit indicators, the BLRT was given more weight, since the BLRT outperforms other indicators of model fit for LCA (Nylund et al., 2007). The six indicators that were used for selecting the appropriate number of classes were chosen based on including the different aspects of the

environment (such as time, cost, distance). For the Household Food Environment latent variable, food assistance from WIC and SNAP as well as food getting items on fresh fruit, fresh vegetables, game meats, and water were used as indicators for exploratory LCA. For the Community Food Environment, six food-related items encompassing the breadth of factors related to access (including time, availability, price, distance, food outlet type) were used for exploratory LCA. Lastly, for the Community Physical Activity Environment, all six physical activity-related indicators from the Community Resources and Environment section were used for exploratory LCA.

After the number of classes was determined, LCA was conducted with the selected number of classes using a full set of indicators, and each participant was assigned to a latent class based on their highest probability for class membership based on their posterior probabilities of class membership. We summarized patterns by presenting the latent class probabilities (estimated prevalence of each subgroup in the study sample) and conditional probabilities of indicator responses in each class. To further describe the latent classes, we tested for similarity of baseline characteristics between classes using a significance level of $\alpha=0.05$. In each case, two classes were identified: Pearson's chi-squared test was used to examine differences in categorical frequencies, two-sample tests of proportions were used to examine differences in dichotomous variables, and two sample t-tests were used to examine differences in continuous variables with normal distributions by class, and Wilcoxon rank sum tests were used to examine differences in continuous variables in non-normal distributions by class.

Paper 3 (Sustainability of MLMC obesity preventions): Data analysis involved both inductive and deductive coding rounds. First, an inductive coding approach, drawing from principles of Grounded Theory (Charmaz, 2006), was used to enable the lead author to familiarize herself with the data and identify key themes. Initial coding and focused coding (Charmaz, 2006) were used to identify themes related to sustaining health programs as well as OPREVENT2 feedback. This topic was then reviewed to identify themes related to sustaining health programs. Memoing was used throughout this round of coding to understand the relationships between domains and revising definitions of the domains (Charmaz, 2006). In the second round of coding, the nine domains (i.e., funding stability, organizational capacity, program evaluation, public health impact, program adaptation, communication, partnerships, strategic planning, and political support) and their descriptions from the Public Health Program Capacity for Sustainability framework by Schell et al. formed the basis of our deductive codebook (S. F. Schell et al., 2013). We coded in-depth interviews and workshops transcripts and notes, allowing excerpts to have multiple codes (Schell themes) assigned. This framework was selected based on its overall fit of the domains with the preliminary results from the first round of coding. Dedoose analysis software version 8.0.42 was used for coding and memoing ("Dedoose," 2016).

3.11 Ethical Approval

Ethical Approvals. Because of the sovereignty of federally-recognized Tribes in the US, each community must provide community-level assent to participate in the OPREVENT2 study. The OPREVENT2 study team gathered multiple levels of approvals in each participating community prior to the OPREVENT2 study. Presentations were given to

participating communities and local governments Tribal and Chapter Resolutions were obtained for all participating communities, along with approvals from local school and health boards. The Indian Health Service Institutional Review Board (IRB), Navajo Nation Human Research Review Board, and Johns Hopkins School of Public Health IRB approved the study protocols and included the formative research phase of the OPREVENT2 study. As part of their review of the formative research phase data collection, the Johns Hopkins School of Public Health IRB has determined that the OPREVENT2 formative research was non-human subject research. Their decision was based on the both the proposed interview questions and the types of interviewees that we planned to recruit. The formative research aimed to ask participants about their job positions in the community and about the community in general.

Data Safety and Monitoring Board. The sponsor of this grant required that all funded studies establish a Data and Safety Monitoring Board to oversee the safety of all research participants, including those of the formative research stage. The PI, and Dr. Caballero, the medically qualified co-investigator, are responsible for the regular monitoring of the study data. The Board meets regularly to review and follow adverse events and serious adverse events until they are resolved or withdrawn when medically appropriate. As Community Action Component Lead, I provided regular reports to the Board regarding the data that was collected. Regular reports on the OPREVENT2 baseline data were provided to the Board by the OPREVENT2 data manager, Lisa Poirier, and OPREVENT2 biostatistician, Dr. Elizabeth Ogburn.

3.12 Tables for Chapter 3

Table 1. OPREVENT2 intervention round received and participation in dissertation data collection

	OPREVENT2 communities			
	Pilot communities	Round 1 communities	Round 2 communities	Total
Midwest	Community A*	Community B*†	Community C†	3
Southwest	1	Community D*† 1	2	5
Total	2	3	3	8

*Data were used in analyses of Papers 1 & 3

†Data were used for Paper 2 analysis

Table 2. Summary of OPREVENT2 communities participating in dissertation data collection

Intervention received (pilot, Round 1, Round 2)	Community Label	Region	Language family	Approximate population size
Pilot	Community A	Midwest	Anishinaabe	1,500
Round 1	Community B	Midwest	Anishinaabe	1,500
Round 2	Community C	Midwest	Anishinaabe	2,000
Round 1	Community D	Southwest	Southern Athabascan	3,000

Table 3. Timeline of dissertation data collection

Paper	Data collection phase	Community	Data collection methods	Timeframe
Paper 1 (Processes for environmental change) & Paper 3 (Sustainability of OPREVENT2)	**Phase 1 data collection**	Community A	In-depth interviews, observations, modified talking circle	August 2015 – September 2016
	Phase 2 data collection	Communities B & D	Workshops	August 2016 – November 2016
			In-depth interviews	March 2017 – November 2017
Paper 2 (Latent Class Regression)	**Baseline data collection**	Communities B, C, & D	Adult Impact Questionnaires	September 2016 – May 2017

Chapter 4. Processes for developing policy, systems, and environmental changes to promote wellness in three Native American communities: A modified Grounded Theory approach

4.1 Abstract

Obesity and related chronic diseases for Native Americans (NAs) continues to be disproportionally high. There is increasing interest in developing health policies to promote population health, however little of this work has examined ways that Tribal Nations (TNs) engage in this work. We used a modified Grounded Theory methodology to develop a conceptual framework describing the processes for developing policy, systems, and environmental (PSE) changes in three NA communities in the Midwest and Southwest. We collected qualitative data, including 46 in-depth interviews, one modified talking circle, two workshops, and 14 observations Participants in our data collection included Tribal Representatives and staff, health staff/board members, store managers/staff, and school staff. Health staff and board members were influential towards identifying and developing PSE changes when there existed a strong relationship between Tribal Council and health department leaders. We found that Tribal Councils looked to local health staff for their expertise and were involved in the approval and endorsement of PSE changes. Tribal grant writers worked across departments to leverage existing initiatives, funding, and approvals to achieve PSE change. Participants emphasized that community engagement was a necessary input for developing PSE change, suggesting an important role for grassroots collaboration with local community members as well as health and grant writing staff. Relevant contextual factors impacting

the overall processes for developing PSE changes included historical trauma, perspectives of policy, "tribal politics", and insider/outsider voices. This is the first known paper to explore the processes for developing PSE change in NA communities, which is an important gap to be addressed if structural changes are to be explored and enacted to promote tribal health.

4.2 Introduction

Obesity and related chronic diseases for Native American (NA) populations in the US is disproportionally high and reflects the ongoing need for environments supporting healthy eating and active living. Based on data from the Indian Health Service (IHS) user population, 81% of Native adults are overweight or obese and 54% are obese (Indian Health Service, n.d.). Among NA children, (Indian Health Service, n.d.), approximately one in three are obese, which is twice as high as the rate for non-Native children in the US. Accompanying these high obesity rates is a high burden of chronic diseases, including type 2 diabetes and cardiovascular disease. In fact, as of 2014, six of the top ten leading causes of deaths among NAs were attributable to obesity-related NCDs (Heron, 2016).

Tribal communities are primarily rural and have less access to grocery stores and supermarkets which tend to stock fresh foods (Kaufman, Dicken, & Williams, 2014b). Only 25.6% of people living on federally-recognized Tribal reservations live within one mile of a supermarket, compared to 58.8% of the general population (Kaufman et al., 2014b). A recent report documenting national average food prices of a hypothetical grocery basket including milk, bread, eggs, chicken, ground beef, apples, tomatoes, regular coffee and decaf coffee in 40 Native communities found that foods are

consistently more expensive in these communities ($31.69) as compared to national average prices ($23.28) (First Nations Development Institute, 2016). The high price and low availability of healthy food items have a large impact on purchasing behavior, driving purchases towards cheaper and less nutrient-dense foods (Drewnowski, 2004)

Health inequity refers to differences in health status between populations that are a result of social injustice and requires a social determinants of health approach (Health, 2008). For NA populations, health inequities cannot be understood without examining the history of federal and state policies towards Tribal Nations (TNs). Broadly, federal and state policies impacting TNs have gone through different eras: Colonial; Removal, Reservation & Treaty; Allotment and Assimilation, Indian Reorganization; Termination; and Self-determination periods (National Congress of American Indians, 2015). For example, NA health has suffered from insufficient funding, despite the fact that treaties between the federal government and TNs recognize the provision of healthcare and protection for NA populations in exchange for use of traditional lands (Warne & Frizzell, 2014). Other federal policies have taken NA children away from their families and placed them in boarding schools in an effort to "kill the Indian and save the man", causing profound collective trauma and separation from their lands and families (Churchill, 2004). Examining these federal policies towards NA populations provides context and drivers for health inequality (Chowkwanyun, 2011)

Multiple policy development theories, including Multiple Streams (Kingdon, 2003), Advocacy Coalition Framework (Sabatier & Sabatier, 2016), and Punctuated Equilibrium Theory (Wollin, 1999) provide useful information for advocating for policies but overlook other mechanisms for producing systems and environmental changes. Policy,

systems and environmental (PSE) changes refer to strategies that make sustainable structural changes that address the causes of inequities (The Food Trust, 2012).

OPREVENT2 is a multi-level, multi-component obesity prevention trial to evaluate the impact of five programs working in food stores, worksites, schools, media, and community engagement. The Community Action Component aims to promote PSE changes in partnership with communities; however, to promote PSE changes in Native communities, interventions need to be grounded in existing mechanisms for creating these changes. To our knowledge, little previous research has examined PSE change processes that occur in federally-recognized Tribes. To address this gap in the literature, our research aim is to describe the existing actors and processes in Native communities that are used to develop PSE changes to support healthy eating and active living as well as the contextual factors that influence these processes.

4.3 Methods

OPREVENT2 is a multi-level, multi-component (MLMC) obesity prevention trial that is currently being implemented with six Native communities in the Midwest (N=2) and Southwest (N=4) (Gittelsohn et al., 2017b). These six main trial communities were stratified by region and randomly assigned to receive the intervention in either Round 1, or Round 2 of the intervention (Gittelsohn et al., 2017a). Two communities were assigned to be pilot communities based on their comparison status for a previous trial. Data collection occurred in two phases. Phase 1 involved in-depth interviews, modified talking circles, and direct observations to explore processes for enacting environmental change with one pilot community. Phase 2 involved in-depth interviews and workshops to confirm and clarify findings among OPREVENT2 Round 1 communities (Table 4).

These data were collected to identify and pilot strategies to facilitate the development of structural changes promoting healthy eating and active living and identify strategies to promote the long-term sustainability of the OPREVENT2 program. Phase 1 data were collected between September 2015 and September 2016 in one pilot community in the Midwest, and Phase 2 Tribal leader and health staff workshops and in-depth interviews were collected in two Round 1 communities in the Midwest and Southwest between July 2016 and November 2017.

In-depth Interviews. In total, 28 interviewees from three communities participated in 46 in-depth interviews with interviewee groups, including 12 Tribal Government representatives and staff, 9 health staff, 3 store staff, and 4 school staff and administrators) (see Table 5). In-depth interviews were conducted to understand existing mechanisms for developing health policies and other environmental changes. Development of in-depth interview guides was based on the study team's previous work with Native communities (Gittelsohn & Rowan, 2011; Gittelsohn, Rowan, & Gadhoke, 2012) and from interview guides used in the American Indian Healthy Eating project (Fleischhacker, Vu, Ries, & McPhail, 2011). Interviews lasted between 12 minutes and four hours (mean=48 minutes; range: 18-240 min), depending on the availability of participants. Interview topics included: previous chronic disease prevention programs and their development, community resources influencing healthy eating or physical activity, initiatives to increase access to healthy foods or physical activity resources, understanding Tribal Resolution approval process, institutional policies, and existing health policies in place (See Appendix 9.1). Interviews were open-ended and exploratory, with the interviewer probing interviewees to expand on the stages and factors related to

developing and approving health policies and environmental change initiatives. Initially, Tribal Representatives and employees and health staff were recruited to participate in in-depth interviews. Participants were eligible for interviews if they were: over the age of 18, English speaking, and had either knowledge about health promotion activities in the community or Tribal or institutional policy development processes as part of their position in the community. Theoretical sampling was used to identify participants for subsequent interviews in order to develop and refine emergent categories for the analysis (Charmaz, 2006). Theoretical sampling was used to identify subsequent interviewees as well as guided follow-up interviews with 8 participants (Charmaz, 2006). Audio recording and verbatim transcripts were used when interviewees provided consent. However, at the request of in-depth interview participants, 12 interviews with six participants were documented using typed notes only. For these interviews, notes were typed verbatim as much as possible and were expanded immediately after interviews, while tracking what text was added.

Modified talking circle. One modified talking circle was held in Community 1 to garner insights about environmental changes with health staff and community advisory board members in Community 1. The talking circle format was adapted from the American Indian Healthy Eating Project (AIHE) (Fleischhacker, Vu, Ries, & McPhail, n.d.). Talking circles are traditionally used to facilitate discussions among groups of NAs in an egalitarian and non-confrontational way but was adapted for data collection (Fleischhacker et al., n.d.).The modified talking circle was developed as a culturally appropriate way to build partnerships and garner insights from Tribal Leaders about healthy eating and using environmental and policy strategies to improve access to healthy

foods among seven diverse NA communities as part of the AIHE (Fleischhacker et al., n.d.). Compared to focus groups, only one person speaks at a time when holding the talking stick/item (Fleischhacker et al., n.d.). Modified talking circles were used to understand consensus regarding policy options and to identify solutions to existing barriers to implementing health policies. The talking circle session was audio recorded and transcribed verbatim.

Workshops. Two workshops were held with Tribal Representatives and health staff in Communities 2 and 3. Workshops were used to gather feedback on preliminary results from Community 1, to adapt findings/strategies based on processes for making PSE changes in communities 2 and 3, and to identify community partners for the intervention. Digital audio recordings of the workshop sessions were collected and transcribed verbatim for analysis.

Observations. Observations of two OPREVENT2 meetings with community representatives and 14 community meetings or events were conducted in Community 1 to understand existing structures for gathering community input on policy decisions. Field notes were recorded both during the meeting and expanded after the meeting was adjourned. Notes were taken on the discussion of health issues discussed, community feedback, and input provided.

Analysis. Grounded Theory is an analysis methodology that develops codes and relationships between codes based on qualitative data (Charmaz, 2006). Use of this methodology can assist in the development of a conceptual framework that is "grounded" in the local descriptions of processes of interest (Charmaz, 2006). By following the Grounded Theory coding strategies, codes are first identified and developed through line-

by-line coding a small subset of informative transcripts (Charmaz, 2006). These initial codes are refined, organized, and collapsed to focus on a specific research question of interest and become focused codes (Charmaz, 2006). These focused codes then become the structure for a codebook that would be used to code all qualitative data. Axial and theoretical coding stages then begin to form relationships within and between codes to develop a conceptual framework (Charmaz, 2006).

A modified Grounded Theory methodology was used to develop a conceptual framework describing processes for creating PSE change in participating communities. The data analysis process was inductive, drawing from principles of Grounded Theory (Charmaz, 2006). We used a multi-step coding process, which included initial coding, focused coding, axial coding, and memoing (Charmaz, 2006). Initial coding was used to code line-by-line and incident-by incident (Charmaz, 2006). Initial coding was conducted using five transcripts that provided an overview of the environmental change processes from various perspectives from Community 1. In vivo codes and gerunds were used for initial codes to stay close to the data as well as the processes being described (Charmaz, 2006). These initial codes were then pared down to focused codes after duplicates/similar codes were collapsed, which by that point were more closely related to the research question and would become the primary analytic categories of a codebook. This codebook of focused codes was used to code the remaining in-depth interview and workshop transcripts, allowing for flexibility for new codes (Charmaz, 2006). Lastly, axial coding was used to understand the dimensions of each focused code and to develop subcodes and relationships with the larger codes. Data analysis included the use of clustering and freewriting memo writing strategies to reflect on the researcher's role in

shaping the research, create definitions for codes and making connections between codes (Charmaz, 2006). Theoretical sampling was used to reach a saturated description of themes emerging from the data and inform additional data collection (Charmaz, 2006). Dedoose analysis software version 8.0.42 was used for coding and memoing ("Dedoose," 2016).

This research was approved by the Johns Hopkins School of Public Health Institutional Review Board (IRB) and the Indian Health Service IRB. The OPREVENT2 participating communities provided Tribal Resolutions in support of the program and the study. Based on JHSPH IRB review, the formative research phase of the OPREVENT2 study was deemed non-human subjects research (NHSR), since the data collection instruments asked about the community in general and did not ask participants personal questions and because we were interviewing participants in their official positions in the community. Due to the formative research NHSR status, consent forms were not required, though we provided compensation ($20 for interviews and modified talking circle participants, $50 for workshops).

4.4 Results

Pathways for Implementing PSE Changes

We found that there were several actors that were involved in distinct ways to develop PSE changes, including community members, health department staff and leaders, grant writing departments, and Tribal Councils. We will describe the roles of each of these in this section, followed by a description of contextual factors that were described as relevant to this PSE change process. In the participating communities, PSE changes occurred in a variety of ways, with formal Tribal policies being just one approach.

Because of this richness of strategies that existed in NA communities to promote structural PSE changes, what emerged from this analysis was the ways in which community advocates navigated within decision-making structures to achieve the desired PSE changes. The conceptual framework that emerged from this analysis is shown in Figure 3.

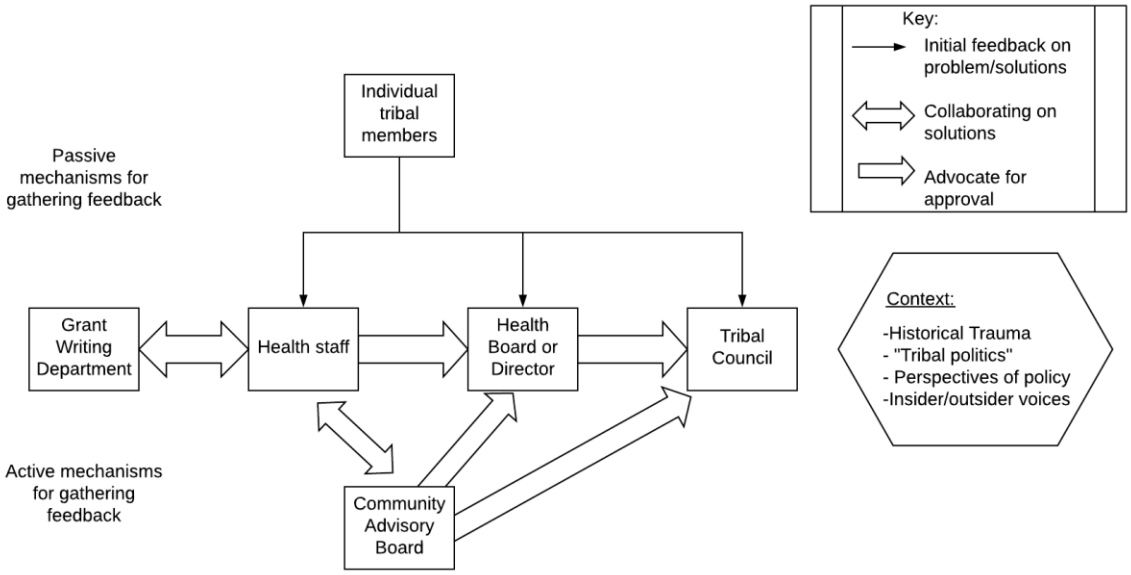

Figure 2. Actors, processes, and context for creating PSE change in Native communities

Key actors and roles in developing PSE change

1. Community members: providing input on health issues and feedback on PSE changes

Participants from all communities emphasized the need for community involvement when developing PSE changes. Buy-in from community members was described as a key way to have PSE changes be successful in changing behavior. One school staff member stated,

> "Like the wellness policy, it's not adhered to because nobody really had buy-in on it…I really think, for our community, that it has to be parents, it has to be kids. They all have to be involved in it. Or it's not gonna happen." - School Staff

Health staff also described the role of community members in developing programs and activities:

> "We try to get community feedback…So a lot of times, a lot of our newer ideas…is something that we've either identified through focus groups or through…our tribal population. Of things that are either looking for or they need…But…we try to have community buy-in, say, in most of our community health programs." - Health Staff

Participants described both informal (passive) and formal (active) ways to gather community member feedback. Passive mechanisms involved community members bringing their feedback and concerns to Tribal Representatives or department staff concerning an issue, while active mechanisms involved Tribal Representatives or department staff intentionally seeking feedback from community members. Examples of passive ways that were used to gather community input included: community members attending Tribal Council meetings, attending board meetings, or going directly to departmental staff or Tribal Councilmembers. Tribal Council meetings and other board meetings were typically a way for community members to engage with leadership and provide feedback on both the problems and proposed solutions. Community members could also raise their issues directly with local staff or Councilmembers. Tribal Representatives in one community particularly encouraged openness with community members and promoted an "open door policy" for tribal members to come in and talk

about any issue. When asked about who typically comes forward with policies, one participant stated,

> "There's really no makeup of people who come in. It's anybody within the community. And staff comes, and…makes a recommendation, or…has an idea. Starts out as an idea, and it can develop into to full blown…departmental policies over time…People come and knock on my door…and we instruct the other directors as well…that we always have an open-door policy. If a tribal member comes in and has an issue…at least hear them out. Point them to…whoever can help them the most, or if you can, then…you help them out." - Government representative/staff

Examples of active ways that were used to gather community feedback included community advisory boards and focus groups/committees. One community's advisory board meetings were held monthly with a small group of volunteer community members to gather feedback and input on health issues. In these meetings, health staff developed the agenda and involved the CAB members in various activities, including brainstorming for events and activities, providing education to CAB members, training CAB members to collect data, recruiting for events, and providing training opportunities. One health staff member described the role of the community advisory board,

> "I would say that they're involved in almost everything that we've done. If they're not directly involved, we've gotten our projects to them and said, 'What do you think? Well, how can we make it better?'" - Health Staff

One important role that CAB members played was in advocating for health PSE changes. For example, CAB members presented policies to Tribal Council alongside local health staff. Health staff perceived this to be a key reason for successful policy change. The feedback gathered at the CAB meetings also provided an opportunity for collaboration with health staff. Health staff, in turn, developed ways to incorporate suggestions from CAB members and developed activities into health programs.

> "[This] group of people… are continuing to come for no benefit, other than we listen to them... And sometimes we come up with ideas and they actually tell us some of the stuff that they want to do and we…try to make it fit into our grant funding." - Health Staff

Focus groups or committees were used to develop health programs that were tailored to address community member's needs, often in response to a particular concern.

> "Usually the way that we work is when there's an identified need, there's usually a group of people that…get together and talk about it first…A group gets formed [of] people who would be interested or affected by the policy…come together and bring their expertise and then….we go to the Council and we say okay, 'here are the choices about how you could develop this'" Government representative/staff

2. Health staff: identifying PSE problems and solutions

Health staff were key to developing PSE changes in NA communities because they were viewed as local experts. The primary role of health staff in each of the communities was to manage and deliver health programs for the community. This role also gave them frequent engagement with community members since they regularly connected with

patients as part of their day to day work. Tribal Representatives, other staff in the community, and community members also looked to health staff for their health expertise.

> "[Tribal Council is] put in [the] position to make decisions and, for [the] most part, [they] don't go out to seminars or whatever that['s] out there…[Tribal Council members] surround [themselves] with people who you can trust to do that for [them]-…I think the Councils depend on [health staff], and then they go out there, get info, bring it back, incorporate it" - Government representative/staff

Health staff also managed grant-funded health activities, which gave them opportunities to develop PSE changes within existing Tribal approvals for these grants. For example, one pilot community developed a weekly farmer's market on the premises and walking paths with existing grant approvals. Many grants awarded to NA communities require a Tribal Council Resolution. Therefore, if a PSE change was included in an existing Tribal grant approval, then additional Tribal Council approval was not required, though it was common practice to keep Tribal Council regularly informed of all activities. Participants stated that grants were a significant driver for developing PSE changes in their communities. Tribal grant writing departments also ensured that PSE changes activities were compliant with grant reporting requirements.

> "We…talked to the [Tribal Representative] and let him know we wanted to put the equipment out there….[It] kind of goes in a circle, because every grant we have Council Resolutions, so even if we're not up there, if it's in our work plan, they've already signed off on it on some level. So if we're going to get a new grant, Resolution, letter of support, [and get the grant approved]…So when you

think of it that way, they've already given their approval to do that." – Health staff

There were times when additional approval was described as particularly helpful in developing PSE change. Additional approvals were advantageous especially if the environmental change was thought to be potentially contentious. For example, health staff sought additional approval for a smoking policy which would restrict smoking because health staff expected objections due to the prevalence of smoking in the community. When asked about why they chose to go to Council for this particular PSE change, one health staff said,

> "[It's] something that you know people may not be happy with. Going through that route makes it more of an environmental change instead of a you-want-to-do-it, kind of thing…Smoking rates are so high, know you're already up against the majority of people who smoke." Health Staff Member

If a PSE change could not fit into existing funding sources, then progress on the initiative could be stalled; however Tribal Councils would occasionally provide financial support for additional measures. When asked about barriers to developing PSEs, one participant explained,

> "…I know there's been times where they've come up with just a suggestion that we know we can't really make it fit. Either, it doesn't feel within our grant funding, like we've run into that. We're pretty good at mix and matching and reaching out for our support, so if we do run into something that we really can't

do through our grants, we pull it up with the Tribe [for financial support].”– Health staff

Participants described the limited capacity of health staff, due to the limited funding from IHS, which impacts the amount of work that health staff can engage in across the board, and impacts their ability to develop PSE changes

> “IHS keep[s] getting cut and so our staff gets smaller and so when they get smaller then they're stretched thin, so that's where we're at right now.” - Government representative/staff

3. Grant Writing Departments: Promoting collaboration between departments

Collaboration between different departments in the community was described as an important way that PSE changes were developed. Participants described how staff throughout the community came together either formally or informally to develop PSE changes Two of the communities described how they had formal inter-and intra-departmental meetings that facilitated communication about events, grants, and other activities and provided opportunities for staff to collaborate.

Grant Writing Department staff recognized the opportunity to collaborate and brought people together when goals or missions. Since the Tribal grant writing department worked throughout the community and on various topics, they were uniquely positioned to connect staff based on their common goals. For example, in one pilot community, there was increased community concern for improved road safety and infrastructure due to recent traffic fatalities involving pedestrians. Thus, the grant writing department connected the public works and health departments, who were also working

to promote walking and physical activity in the community. The grant writing department worked with the health department to write a grant to support the changes.

> "because I'm searching for grant funding and there a lot of times that everybody is coming to me, and I'm like 'wait a minute, I know this person has funding to do this…and that person is working on that',…and that's why I end up connecting sometimes different programs or departments. 'Cause they're actually going after the same thing...so they can work on it together" - Government representative/staff

Intersectoral work had some notable advantages, including sharing of resources and staff, and building political support. When asked whether it is helpful to be working with other departments in the community, one respondent replied,

> "Yeah, and not just resources-wise too, but also manpower. And then just showing the community working together and the more we get to help each other. And you're sharing resources, you're sharing people and then everybody kinda knows what the other person's doing." – Tribal Government/Staff

An important skill for fostering such interdepartmental collaboration is the ability for teamwork. One participant explains,

> "But I think what's most important and matters is learning how to be a team within the different department[s], learning how to be a team with the nation and learning how to work with the team hired both from the state and federal" - Store Staff

The downside of this informal approach to collaboration is that it relied on the staff that worked there to initiate and sustain these relationships. This kind of intersectoral work took additional time and effort and was not part of people's regular duties. This collaboration could be limited if capacity was an issue. However, intersectoral work was viewed as valuable and had the potential to create meaningful change in the community as it helps people to develop collaborative solutions,

> "We still have a struggle with [getting out of silos]…because everybody is going about their day to day, 40 hour a week job doing it, and it's difficult to take the time to get out there…and that's one of the things where when there's grant funding, that I would say, I sometimes can be that person that goes, 'Wait a minute, someone over here is already doing that'" - Government representative/staff

4. Tribal Council: Approving PSE changes

Approval from Tribal Council was necessary for authorizing local Tribal policies and grants, along with any associated expenditures since the Tribal Council was the primary governing board and oversees all departments in the community. Tribal Council was particularly involved in approving matters related to spending, since "no one has authority to spend money except Council". One participant explained the overall policy development process as follows,

> "[Each] department develop[s] their internal policies, operational policies and submit[s] them to Tribal Council for consideration." – Government representative/staff

We found that Tribal Councils generally acted as community gatekeepers and were less likely to be involved in identifying specific PSE changes. Instead, they looked to department leaders and staff for guidance on strategies and approved the final PSE changes. This was especially the case with health staff since they had the expertise to provide health promotion recommendations.

> "…in general,…[Tribal Council] wait[s] for…staff from those departments to bring and push the ideas of what they wanna see done…but more the ideas of creating new programs are really coming from the staff up to them for approval." - Government representative/staff

In two of the communities, there was a high amount of trust, communication, and collaboration between the Tribal Council and the health staff, which is important to health staff having the flexibility to develop PSE changes. Health staff described meeting informally with the Tribal Council to develop grant ideas in early stages. One Tribal Representative described,

> "[Health Director] does pretty good at implementing new things. All he does is he just needs to update us. So, if he has a project that he's thinking of doing, 'Well, this is where we're gonna start, and I just want your approval that we can do that.' As long as he comes to Council, at least three of us that are available so that we can approve it…And then he'll get approval and then do it...He has a lot of flexibility 'cause we trust his judgment" - Government representative

Based on our data collection, formal Tribal policies were rarely developed and brought to Tribal Councils. When these formal policies were enacted, they were developed by health

staff to support existing grants and programs. Instead of formal Tribal Policies, communities typically used informal policies or systems/environmental changes to promote community health and wellness. Use of formal Tribal Policies was impacted by local contextual factors (described in the next section). Interviewees also shared that changes in health policies could occur when there was a turnover of Tribal Councilmembers. Therefore, communities with more frequent elections and/or a changing Tribal Council may be less likely to have sustained health policies that continue during such changes in administration.

Contextual factors for developing PSE changes: historical trauma, insider/outsider voices, "tribal politics", and perspectives of policy

Participants described the role of important contextual factors that were relevant to the processes for developing PSE changes in their communities. Participants emphasized the role of "historical trauma" in creating conflict within the community and mistrust of outsiders. Historically, policy was used against Native people and outsiders coming in could have dire consequences for NA communities, including removal from their homelands and abduction of children. This historical trauma caused distrust and caution of outsiders.

> "[There is] historical trauma of being forced on reservation and being removed. Always goes back to is, we have elders here who were forced into boarding [school], people coming off-reservation into [the] community was never a good thing before. Still that guarded feeling of someone coming from the outside, who hasn't lived here and isn't us, trying to change things. Until they fully understand, basis for a lot of things, coming in, [and understand that they] are really there to

> help you. that hasn't been the case historically. [Community members were] told they were here to help them, but when you look at what it resulted in, it wasn't helping them." - Government representative/staff

Gathering community feedback was important to balance perspectives from insiders and outsiders of the community. Health staff in each of the communities were predominantly from outside the community, making collaboration with local community members central in building their credibility as health advocates. The advantage of pairing insider and outsider voices is that community members "validate" the recommendations of outsiders and, in turn, the outsider "validates" the insider's concerns.

> "I've been here a long time and most people know me, and I think there's a trust level there. So, I think when I talk at Council, they trust what I'm saying. But if I have three community members standing right next to me shaking their heads saying "Yep, this is what we want" it's way for impactful. Because they're themselves saying this is something we want to do. It's not somebody from the outside saying you have to do it and I think that was huge when we passed the [policy] here." - Health Staff

One Tribal Representative/staff emphasized the need for outside facilitation, by another Native person if possible, since conflicts within the community would be difficult to manage by someone from the community due to historical trauma. They described that the advantage of having an outside facilitator would be that they could bring people together with a fresh slate and without involvement and/or awareness of existing conflicts. Bringing these voices together bolsters claims from both insiders and outsiders.

> "I could give that to a[n outside] person …and [community members] will listen to [them], but not me because I'm from here. To start and build the program, you need outside facilitation. With everything" - Government representative/staff

Because of the historical trauma experienced by Native communities, participants described that Native communities tended to have a lot of conflict due to "internalized" historical trauma. While families have high social cohesion, participants described that there are often conflicts between families within the community. Participants from two communities described the "crab in the bucket" phenomenon. In this allegory, Native communities are described as crabs in a bucket, where one never escapes because the others pull him/her down. This describes how it is difficult to make changes from within the community and that the perspectives of local community members are not always effective in initiating change, due to historical trauma.

Participants also described the role of "tribal politics" in Native communities. One Tribal Representative/staff described "tribal politics" as the "division of people with authority" from the community members, meaning that there comes to be no role for grassroots organization or input. This was also described as the division between the Tribal Council and those with expertise. Participants described that decision-making authority was divided between various representatives and staff to ensure a continued role for input on policies. One Tribal Representative/staff person emphasized the need for both people to develop strong relationships and to trust feedback from staff.

> "[Tribal politics, to me, is the] division of people with authority…and it to me,…it's like a group of people that have their minds made up and are not going to change because they've already got their goals in mind. They've got their own

> goals in mind. Because there's this creation, it creates a division of people, the grassroots people are locked out from any decision making. Because of that, there's a lot of things that don't happen. It's almost like we have to beg for the resources to make it happen. I wanna say at the cultural level, the grassroots level." - Government representative/staff

Because of the unique history of Native Americans, there are a variety of several connotations and meanings attributed to the term policy. Some of the participants highlighted the historical and ongoing struggle with federal and state policies. Interestingly, the term "health policy" was not salient among our participants, with interviewees often describing health programs available in the community. From our analysis, Tribal-level health policies were rare and mainly addressed smoking restrictions. Many participants also often thought that policies would always be about restrictive of freedom and choice and would "dictate" how community members lived. On the other hand, Tribal Representatives tended to have a more nuanced view of policy and thought that policy in and of itself was not inherently good or bad.

> "It's funny how policy can be good and bad and, over the years you know tribal people have always seen policy as a bad thing. They don't realize that we can still develop policies that are good for the community, promote healthy eating, drug-free community and those such things." - Government representative/staff

Interestingly, some participants viewed policy as similar to aspects of traditional culture. For example, two Tribal Leaders saw the role of ceremonial leaders as embodying policy. When asked about community members perspectives about health policy, one Tribal Representative/staff explained,

"I believe that policy has always been a way of life for tribal people. You talked about tradition and you talk about handing down different values, different ways of doing things and that, in essence, is policy…Prior to the white man coming,…Tribes functioned on a real high level of hierarchical level. So, they obviously had policy and, how things were done within villages, within Tribes and within nations and they followed that. Now coming after…the white man, I guess, policy is what drove the Tribes to the point where they were in their sixties or the seventies where they were desolate, poor or destitute. But it was the policy of the United States at the time and, the Tribes of course rose and stood up and said it's about time that [the]Tribes to get back to developing our own policies, developing and leading our own way of life by dictating how we survived. So, I think policy in that sense has worked for us because the Tribes took it back to the more traditional ways and realizing that policy isn't such a bad thing as long as they are positive policies… Tribes have existed and developed because of taking that outside policy, taking the good policies and using them to our advantage and disregarding some of the bad policies that the federal government had placed on Tribes." - Government representative/staff

4.5 Discussion

To briefly summarize our findings, we identified key actors and described their roles in developing PSE changes in three NA communities. Tribal Resolutions promoting PSE changes were infrequently used; however, informal Tribal policies were enacted by Tribal Councils have been used to promote PSE changes. Funding sources must be identified for many PSE changes, and leveraging existing grant funds and approvals can

be a way to develop PSE changes. Health staff are key stakeholders to engage for developing PSE change since they are viewed as local health experts. PSE changes cannot be promoted without community member input. Collaborations between departments (intersectoral work) can also promote PSE changes by providing access to funding sources and resources. There are also important contextual factors which must be considered when promoting PSE change in Native communities, including the influence of historical trauma on local perspectives of policy, "tribal politics", and the importance of pairing insider and outsider voices.

This analysis has several important strengths, including the diversity of communities that participated in this research, making the results more likely to be transferable to other federally-recognized Tribal communities. The use of a modified Grounded Theory approach also aided to develop a conceptual framework that was rooted in the data, making this developed framework more applicable to the tribal settings than broader policy development theories. This research also benefitted from the triangulation of both data collection methods and participants, and so these results are more likely to credibly reflect local processes. An extended amount of time was spent in one community, which had a variety of PSE changes that have been enacted in the community, providing added depth to our results. This research also has important limitations. This analysis heavily relied on data from one community; however, we believe that our phased approach to data collection allowed us to refine our results and enhance the potential transferability of our findings. Transferability of these findings to all NA communities is unlikely, due to the variety of Native communities in the US (over 500 federally recognized Tribes in the US), governance structures, and healthcare structures. For example, transferability of our

findings is limited to Tribes who receive health care directly from the IHS, as opposed to self-governance Tribes, since this would give Tribes more control over how IHS funds were used to address community needs (Warne, 2011).

Though previous policy development theories improved upon the more simplistic heuristic for how policies were enacted, there are key limitations to applying these theories to the development of structural changes in tribal settings. Previous theories have failed to recognize the influence of power in impacting policy decisions and the extent to which they apply to other levels of government, including Tribal or local municipalities. These theories also are limited in their ability to develop other structural changes, including systems and environmental changes, that may not require Tribal Resolutions. Navigating between policy advocacy and other structural changes can help to promote PSE changes in situations when the "policy stream" may not connect with other streams (Kingdon, 2003). It is particularly important to understand this process in tribal contexts since policies enacted in other jurisdictions would not impact NA people on-reservation.

This is the first known conceptual framework describing how PSE changes are developed in NA communities. Such a conceptual framework facilitated the development of an intervention component to promote PSE changes as part of the OPREVENT2 obesity prevention study and can inform future efforts to promote PSE changes in other Native communities. Understanding these existing processes is an important first step to identifying key actors and strategies for promoting PSE change in communities. Understanding the relevant actors and their roles in promoting PSE changes assisted in the development of the OPREVENT2 Community Action Component. This component aims to promote PSE changes in participating communities using monthly coalition

meetings, and we have worked to engage the key actors and the results of this analysis to promote PSE changes as part of the OPREVENT2 intervention.

4.6 Tables for Chapter 4

Table 4. Overview data collection activities by community

	Region	OPREVENT2 intervention received	Data collection - phase 1	Data collection – phase 2
Community 1	Midwest	Pilot	Participated	N/A
Community 2	Midwest	Round 1	N/A	Participated
Community 3	Southwest	Round 1	N/A	Participated

Table 5. Sample sizes by method and community type

	Participant groups	C1 (Midwest)	C2 (Midwest)	C3 (Southwest)	Total Participants
In-depth interviews	Government reps & staff	6	3	3	12
	Health staff	5	0	4	9
	Store staff	0	1	2	3
	School admin & teachers	3	0	1	4
Modified talking circle	Board members & health staff	7	--	--	--
Workshops	Health staff, school staff & Tribal staff	--	8	3	11
	Total	19	12	13	59

Chapter 5. "Describing the Household- and Community-level Food and Physical Activity Environments of three rural Native American communities: An Exploratory Analysis"

5.1 Abstract

Limited research describes the food and physical activity environments of Native American (NA) communities, who experience the highest burden of obesity compared to any other race or ethnic group. Latent class analysis (LCA) was used to describe Household Food Environment (HFE), Community Food Environment (CFE), and Community Physical Activity Environment (CPAE) of three NA communities in the Midwest and Southwest (N=300, aged 18-75). Baseline surveys of the OPREVENT2 study assessed food getting, food assistance participation, health environment attitudes, demographics, and BMI. Exploratory LCA identified an appropriate number of classes by comparing the model fit indicators of 1, 2, 3 and 4 class models. LCA was conducted with the selected number of classes and participants were assigned to classes based on the highest probability for class membership. We examined subgroup differences in demographics and BMI to further describe latent variables. The study sample had "low" and "high" access subgroups related to HFE, CFE, and CPAE. Fresh food availability is generally poor; however, access to game meats was moderate. For the HFA, the higher access subgroup had significantly younger age, larger household size, more children in the household, higher educational attainment, and higher participation in food assistance programs, highlighting potential subgroups for intervention. Mean BMI was 31.2 kg/m^2 and most participants (82.1%) were overweight or obese. Mean BMI did not significantly

vary between low and high access subgroups for all latent variables, due to insufficient variability in the environments. This analysis adds to the growing research examining food and physical activity environments and is the first known analysis among NA communities. Additional research is needed to further characterize NA food and physical activity environments and their relationship to chronic disease risk to identify potential levers for policy change at Tribal and institutional levels.

5.2 Introduction

Native American (NA or Native) people of the US have the highest burden of obesity compared to any other race or ethnic group. The Indian Health Service (IHS) reported that three out of every four (81%) Native adults aged 20-74 years were not at a healthy weight (Indian Health Service, n.d.) Native youth experience the highest burden of any race or ethnic group in the US, with between 25 and 31 percent of children ages 2-19 classified as obese (Indian Health Service, n.d.). This obesity burden is a relatively new phenomenon among NAs that has emerged in the last 30 years (Compher, 2006c). The rise of obesity among NA has occurred alongside a drastic nutrition transition from traditional food systems and daily life that was highly active to one that is dependent on processed foods that are high in sugar, fat, and meat products (Compher, 2006b; Popkin, 2002). The rise in obesity has also resulted in a disproportionately high prevalence of related non-communicable diseases (NCDs), such as heart disease and type 2 diabetes. Native people have the highest prevalence of diabetes of any racial/ethnic group, with 20.9% of Native people self-reporting diabetes diagnoses compared to 8.8% of the US general population (Tables of Summary Health Statistics: National Health Survey, 2016b). Heart disease, cancer, and diabetes are leading causes of death for NA, together

contributing to over 40 percent of all NA deaths (Heron, 2016). Given the many consequences of obesity and related NCDs, it is important to understand environmental approaches to promoting health and wellness that can assist in preventing obesity and preventing the progression of related NCDs.

There is a growing understanding of how the community environment contributes to health and wellness. This expands on the idea and recognition that an individual's behavior is not solely based on their own knowledge and decision-making, but also on the access to healthy options to make active living and healthy eating feasible over the lifespan. A recent systematic review of research examining the association between food environments and obesity found that associations between individual food outlets and obesity were predominantly null, however those using food environment indices of overall healthy food access were more likely to be positive, indicating the need to explore more wholistic measures of the food environment (Cobb, Appel, & Franco, 2015). To date, this perspective has not been applied to characterize the food environments of Native communities – who have unique history impacting their food and physical activity environments and sovereignty to address health and wellness using policy and other environmental changes (Fleischhacker et al., 2012b).

Understanding the nuance associated with the food environment can aid in future interventions in Native communities since classifying them as obesogenic or food deserts based on food store outlets may not capture the entirety of the food system in these settings. A spatial analysis of data from 2010 revealed that 76.7% of tribal households live more than 1 mile from a supermarket, compared to 41.2% of all US households (Kaufman et al., 2014a). While describing access to supermarkets is an important marker

of fresh food access, describing food access in a wholistic manner is important for Native communities. NA communities also have traditional food systems that have provided healthy foods to the people for millennia. Traditional food systems vary by Tribe but can include a combination of gathering wild foods, hunting, fishing, and traditional agriculture. Overreliance on food store access data can be problematic when traditional food sources are still used and valued as part of community identity and must be part of understanding food environments on health (Gittelsohn & Sharma, 2009). Food assistance programs are also an important aspect of the food environment for NA populations. While food assistance programs like Supplemental Nutrition Assistance Program (i.e., SNAP, formerly known as Food Stamps) and Women, Infants, and Children (WIC) are available in food stores in some NA communities, the Food Distribution Program for Indian Reservations (FDPIR) additionally provides food assistance to 276 NA communities that are rural and may not have access to SNAP and WIC certified stores (Byker Shanks et al., 2016). Lastly, the physical activity environments of NA communities have not been described by previous research, making this an important gap to address. Characterizing the food and physical activity environments in Native communities can assist in identifying intervention and health policies to promote environments that facilitate healthy eating and physical activity.

Characterizing environments is challenging for several reasons. Environments are multifaceted. Arguably, they are only indirectly measurable through features that indicate the underlying environmental status but do so imprecisely because they also reflect factors other than the environment. In situations such as these, latent variable analysis may provide a useful characterization method. Latent class analysis (LCA), particularly,

hypothesizes that an overall population of individuals may be grouped into subpopulations ("classes") according to the types of environments they experience. The subpopulations are conceptualized as not fully observable—hence "latent," but indirectly measurable through a collection of indicators of the environment one experiences.

Previous research has used LCA to understand the impact of more latent environmental variables and obesity, such as physical activity environment (M. A. Adams et al., 2011, 2013, 2015; Tu, Lear, Gotay, & Richardson, 2016), food environment (Zhang, Lans, & Dagevos, 2011), and obesogenic environments (Meyer et al., 2015; Wall et al., 2012). To our knowledge, none of this previous research has examined latent food and physical activity environments and the relation to obesity in rural Native communities, since much of this research has been conducted in large urban centers. As well, previous research has also focused on GIS analyses which can be a powerful way to analyze this data, yet the perception of availability can incorporate other aspects of access that are not captured through GIS alone, such as perceived safety and feeling welcome, which can also impact use. Finally, the household food environment has also yet to be explored and can highlight different levels of food access which may be important in rural, Native communities, where community members commonly drive long distances to buy food (Gittelsohn & Sharma, 2009).

This paper aims to address this gap in the literature by describing the patterns related to perceived food and physical activity resource access of Native communities and their relation to sociodemographic and anthropometric data. Such an analysis is needed to understand what targeted structural interventions may best complement existing resources and drive institutional policies and environmental changes. For this

aim, we hypothesized that individuals within the Native communities sampled would be comprised of multiple homogeneous and distinct subgroups, characterized by different patterns of access to and use of the food environment and physical activity environment. We also hypothesized that these subgroups would be related to sociodemographic variables as well as body mass index (BMI).

5.3 Methods

Participants of this study are from the baseline impact assessment of OPREVENT2, a multi-level, multi-component obesity prevention trial among six NA communities in the Midwest and Southwest (Gittelsohn et al., 2017b). Participants of the OPREVENT2 baseline individual impact assessment were recruited from a list of randomly selected tribal members from each community until at least 100 participants from each community (N=600) participated in baseline interviews. For the purposes of this study, a subset of the total OPREVENT2 baseline dataset was used, based on the data use agreements with three of the communities, leaving a sample of 300 participants from three OPREVENT2 communities from the Midwest and Southwest regions of the US.

Tribal members of this list were eligible to participate in baseline interviews if they: provided signed consent to participate, were at least 18 years of age and less than 75 years of age; considered themselves part of the participating community; lived in the community for at least 30 days; planned to live in the community for the next 18 months; were not pregnant or breastfeeding; did not participate in Tribal member workshops; and self-identified as either the main food preparer or shopper for their household. All participating communities provided Tribal approval for the study. The research and instruments and consent forms were approved by the Johns Hopkins School of Public

Health Institutional Review Board (IRB), the Indian Health Service IRB, and the Navajo Nation Human Research Review Board.

I. Data Collection Methods

OPREVENT2 data collectors received training and certification to perform all aspects of the baseline individual impact interviews in the summer of 2016. Four of the seven OPREVENT2 data collectors are highly experienced data collectors, with over 40 years of combined experience conducting research in Native communities. Interviews were conducted in English.

Baseline OPREVENT2 individual impact interviews included an: Adult Impact Questionnaire (AIQ), which gathered information regarding: individual food access (food getting, participation in food programs), psychosocial measures (i.e., knowledge, intentions, self-efficacy, health attitudes), demographics (e.g., age, education, socioeconomic status, family medical history), attitudes about the community food and physical activity environment, as well as anthropometry (e.g., weight, height) (See Appendix 9.2). Data were entered using Microsoft Access and extreme values were double checked and re-entered. LCA was conducted using MPLUS version 8 (Muthén & Muthén, n.d.) and bivariate analyses comparing sociodemographic variables and BMI of latent classes were conducted with Stata software version 15.1 (StataCorp, 2017).

Body mass index (BMI). The anthropometry section of the AIQ included measures of height (inches) and weight (pounds). Height and weight measures are estimated at least twice, and a third measurement was taken if the height measurements differed by more than 0.5 inch and if the weight measurements differed by more than five pounds. Average

height and average weight measurements were used to calculate the BMI of each participant in kg/m^2 using the following formula:

$$BMI = \text{weight (lb)} / [\text{height (in)}]^2 \times 703$$

Latent variables. The Food Assistance, Food Getting, and Community Resources and Environment sections of the AIQ include indicators for three hypothesized latent variables: Household Food Environment, Community Food Environment, and Community Physical Activity Environment. The following section describes the indicators of each latent variable.

Latent variable 1: Household Food Environment. Six questions regarding food assistance and 26 questions regarding household food getting were used to characterize the Household Food Environment. The Food Assistance section (See Appendix 9.2; questions 135-144) assessed household participation in food assistance programs (including WIC, SNAP, and commodity foods), and respondents answered with a dichotomous yes/no response. Food assistance sources were excluded if they were uncommon (if either of the binary responses were less than 5%), and so food assistance from the Tribe, farm surplus, and summer food programs were not included in this analysis. The Household Food Getting Section (see Appendix 9.2; questions 1-26) asked participants about the frequency that they or other household members were able to obtain certain healthy food items in the previous 30 days. These foods could be purchased, received from food assistance programs, received from a friend or family member, or received from hunting or fishing. Prepared foods from restaurants or other prepared food vendors were not included.

Latent variable 2: The Community Food Environment. The Community Resources and Environment section assessed the binary level of agreement and disagreement to eight statements related to the perception of the community food environment, including items relating to different dimensions of food access, including having time, price of healthy foods, and traditional food access (See Appendix 9.2, questions 78-84 and 89).

Latent variable 3: The Community Physical Activity Environment. This latent variable also used indicators from Community Resources and Environment section assessing the agreement of seven statements related to perception of the community physical activity environment, including items relating to different dimensions of physical activity access, including presence as well as use of physical activity facilities, and safety (See Appendix 9.2, questions 85-88 and 90-92):

Analysis. LCA is a data-driven approach to identify underlying subgroups ("classes") of which an overall population is comprised based on patterns of responses to a set of correlated dichotomous indicator variables (McCutcheon, 1987). LCA uses maximum likelihood estimation to obtain the following parameter estimates: latent class probabilities (i.e., the prevalence of each subgroup/class in the sample) and conditional probabilities for each indicator given class membership (i.e., the probability of indicator responses within each class) (McCutcheon, 1987). These two types of parameters can be combined to compute "posterior" probabilities of belonging to each class given one's observed pattern of responses (McCutcheon, 1987). LCA models assume conditional independence of indicators within classes—that is, homogeneous reporting up to uncorrelated measurement error—as well as independence of observations (McCutcheon, 1987).

To implement the analysis, a first step was to dichotomize household food getting variables based on if respondents had never gotten (0 times per month) or ever gotten (at least once per month) each food item. For foods that were purchased more frequently (i.e., the frequency of never getting the food item was less than 10% for the previous month), variables were dichotomized into categories for weekly (0-4 times per month) and more than weekly (5 or more times per month), which was done for fresh fruit, fresh vegetables, canned vegetables, poultry, and water items.

Next, exploratory LCA was conducted to identify the appropriate number of classes by comparing the 1-, 2-, 3-, and 4-class models that used a subset of six indicators for each latent variable. Here, we aimed to avoid gross overfitting by limiting the analysis to six indicators (See Table 6 for a list of indicators used for exploratory LCA). For each latent variable, the number of classes was chosen based on a combination of model fit statistics, including Bayesian information criterion (BIC), Lo-Mendell-Rubin (LMR), bootstrap likelihood ratio test (BLRT) (Nylund et al., 2007), the number of extreme standardized residuals (>1.96 or <-1.96), and model precision (based on size of standard errors of indicator probability estimates). For interpretation of the model fit indicators, the BLRT was given more weight, since the BLRT outperforms other indicators of model fit for LCA (Nylund et al., 2007). The six indicators that were used for selecting the appropriate number of classes were chosen based on including the different aspects of the environment (such as time, cost, distance). For the Household Food Environment latent variable, food assistance from WIC and SNAP as well as food getting items on fresh fruit, fresh vegetables, game meats, and water were used as indicators for exploratory LCA. For the Community Food Environment, six food-related items encompassing the

breadth of factors related to access (including time, availability, price, distance, food outlet type) were used for exploratory LCA. Lastly, for the Community Physical Activity Environment, all six-physical activity-related indicators from the Community Resources and Environment section were used for exploratory LCA.

After the number of classes was determined, LCA was conducted with the selected number of classes using a full set of indicators, and each participant was assigned to a latent class based on their highest probability for class membership based on their posterior probabilities of class membership. We summarized patterns by presenting the latent class probabilities (estimated prevalence of each subgroup in the study sample) and conditional probabilities of indicator responses in each class. To further describe the latent classes, we tested for similarity of baseline characteristics between classes using a significance level of $\alpha=0.05$. In each case, two classes were identified: Pearson's chi-squared test was used to examine differences in categorical frequencies, two-sample tests of proportions were used to examine differences in dichotomous variables, and two sample t-tests were used to examine differences in continuous variables with normal distributions by class, and Wilcoxon rank sum tests were used to examine differences in continuous variables in non-normal distributions by class.

5.4 Results

Table 7 describes the study sample which includes data from three of the six total communities participating in the OPREVENT2 baseline sample (300 participants from three communities). Participants' average age was 46.8 years (SD=13.9), and most were female (74%). On average, a household comprised of three people and one child.

Participants reported that they were predominantly: full-time employees, had some post-secondary education, and were either single, separated, widowed or divorced. In terms of food assistance, 61% reported receiving at least one form of food assistance, most commonly from SNAP or senior center meals. Mean BMI was high, with average BMI over 30 kg/m^2 among study participants.

Based on the exploratory latent class analyses (Model Fit shown in Table 8), we found that multiple classes could better explain the heterogeneity of environment indicators than a single class for all latent variables of interest. For the Household Food Environment, a two-class model had a marked reduction in extreme standardized residuals compared to a one-class model. The LMR and BLRT both indicated that the three-class model fit significantly better than a two-class model. Models larger than two classes (three-and four-class models) were ruled out, however, because they did not have a substantial decrease in the number of extreme standardized residuals and they had reduced precision (data not shown), and so a more parsimonious two-class model was used to describe the Household Food Environment. For the Community Food Environment, a two-class model was selected since the LMR and BLRT both strongly suggested that the two-class model fit significantly better than a one class model. The two-class model also had fewer extreme standardized residuals compared to the one class model (with minimal reduction for three-and four-class models) and was more precise than the three and four-class models. For the Community Physical Activity Environment, the two-class model was selected due to having the lowest BIC, statistically significant results for LMR and BLRT compared to a one-class model, a reduction in the number of extreme standardized residuals, and higher precision than models with more classes.

Tables 9, 10, and 11 present the estimated prevalence of each indicator for each latent variable of interest. The Household Food Environment can be described by two subgroups: the "higher household food access" (class 1) and "lower household food access" (class 2) groups (Table 9). The class 1 "higher household food access" group tended to have higher probability of getting all healthy food items in the previous 30 days compared to class 2, except for low-fat milks which was equal across classes. This "higher household food access" group also had higher probability of participating in food assistance programs compared to class 2, except for Food Bank and Senior Center meals. Notably, the group that had lower household access to foods made up the majority (58.1%) of the study sample. Access to fresh fruit, fresh vegetables, poultry, skim milk, and milk alternatives was low, even in the "higher household food access" group. Access to game meats was moderate across both classes, with 63% of people in class 1 reporting ever getting game meats in the previous 30 days compared to 43% in class 2. Similarly, the Community Food Environment can be described by two groups: a "higher food access" group (class 1) and the "lower food access" group (class 2). The class 1 group is called "higher food access" since it generally has higher probability of agreeing with statements about the community food environment that relate to food access compared to class 2, excepting traditional foods and going to a nutritionist for advice. Contrary to the Household Food Environment, the "higher food access" group had high prevalence, accounting for approximately 85% of the study sample. Despite this, there was perceived to be very low access to fruits and vegetables, even in the high food access group. Many people in both classes also reported having high access to traditional foods and report rarely going to a nutritionist for advice. Lastly, the Community Physical Activity

Environment can also be described by two subgroups: “higher physical activity access” group (class 1) and “lower physical activity access” (class 2). The “higher physical activity access” group had generally higher probability of agreeing to statements from the Community Environment and Resources section that relate to physical activity resource use compared to class 2, except for the items related to safety and confidence. Like the Community Food Environment, class 1 was more prevalent in the study sample (72%) and was characterized by generally higher access to physical activity resources. Class 1 had higher interest in additional exercise options and exercise opportunities and was more likely to identify time as a barrier compared to class 2.

Table 12 describes demographic characteristics for each latent variable by class based on most-likely class membership. For the subgroups of the Household Food Environment, 125 (41.7%) and 175 (58.3%) of the study participants were members of class 1 (“higher household food access”) and 2 (“lower household food access”) respectively. Comparing these classes, participants of class 2 had significantly higher mean age as well as lower mean household size and children per household than class 1. Class 2 of the Household Food Environment also exhibited a different distribution of education responses compared to class 1, with more people reporting having less than a high school diploma and fewer people reporting having some post-secondary education or completed post-secondary education but more people having advanced degrees; this result fell short of the traditional significance threshold ($p=0.061$). Although this “lower household food access” subgroup had similar participation in food assistance in general, this group reported significantly lower participation in all individual food assistance programs, but higher participation in senior center meal programs. There were no

significant differences for gender, employment status, marital status or BMI among classes of the Household Food Environment. Second, the Community Food Environment comprised 248 (82.7%) in class 1 ("higher food access") and 52 (17.3%) in class 2 ("lower food access"). There were no statistically significant differences comparing demographic variables or BMI between these two latent classes, due to the small sample size of class 2. Third, the Community Physical Activity Environment was distributed into two subgroups: 213 (71.0%) and 87 (29.0%) in class 1 ("higher physical activity access") and class 2 ("lower physical activity access"), respectively. Like the Community Food Environment, there were no statistically significant differences comparing demographic characteristics or BMI (also due to small sample size of class 2), although members in the "lower physical activity access" group had significantly higher participation in church-based food assistance compared to higher access group.

Several sensitivity analyses were conducted to establish the stability of our results. First, for identifying the appropriate number of classes as part of the exploratory latent class analyses, we also examined the frequency of patterns having high standardized residuals (>1.96), and ensured that for each selected class, all such patterns were rare (represented <1% of the data sample). Second, for the Household Food Environment, we checked to see if fresh foods (i.e., fresh fruit, fresh vegetables, game meat, poultry) were independently associated with BMI since the classes were not well-distinguished on the healthy choices. We found that none of these were independently associated with BMI, demonstrating the utility of examining the overall food environment and access as opposed to individual indicators. Third, we conducted an analysis of the Household Food Environment using three classes and found that this three-class model did not have

statistically significant different mean BMI. Fourth, for every latent variable, we analyzed the class composition by community and found that every community had similar class distributions as the overall sample. Lastly, we ran a structural equation model for each latent variable, regressing latent classes on indicator variables for community. We found that the results for Household Food Environment and Community Physical Activity Environment were stable. However, for the Community Food Environment, probabilities of manifest variable categories within classes changed dramatically after incorporating indicator variables for community, indicating that communities differentially vary in their reporting of community food environments. One of the classes in these analyses, moreover, appeared to include virtually all individuals from two of the sampled communities. This indicates that the available indicators do not suffice to capture community food environments in a way that is generalizable across Native communities.

5.5 Discussion

In summary, we found that the study sample from three Native communities from the Midwest and Southwest had were comprised of two clear subgroups related to Household Food Access ("higher" and "lower household food access", Community Food Access ("higher" and "lower food access", and Community Physical Activity Access ("higher" and "lower physical activity access"). In general, fresh food availability is poor; however, household food getting for game meats, an indicator of traditional food access, was moderate. A large portion of the sample reported interest in eating healthier if they had more training and affordable choices as well as additional exercise opportunities. Traditional food access was moderate in both higher and lower food access groups, indicating that this is an important food source to be considered among this population.

For the Household Food Environment, the subgroup with higher food access tended to have significantly younger age, larger household size, more children in the household, higher educational attainment, and higher participation in food assistance programs, highlighting potential community subgroups for future intervention.

This research also adds to the growing area of research on the food environment and relationship to adiposity. Zhang, et al. identified four latent classes related to food fast food, snack food, and sodas preferences and related this to indicators of the food environment obesity, but found no association between preferences and obesity (Zhang et al., 2011). In a latent class analysis of obesogenic environments using geo-coded food and resource indicators, Meyer, et al. found inconsistent associations between class membership and BMI, with modest association between BMI and the "moderate obesogenicity and moderate development" class using data from the CARDIA study (Meyer et al., 2015). In another analysis of obesogenic environments, Wall, et al. used spatial latent class analysis to identify six classes found inconsistent associations between classes and adolescent obesity (Wall et al., 2012). This research provides a contribution by examining the environments of rural, Native communities.

Our analysis has important strengths to consider when evaluating this study. This is the first known study to utilize latent class analytic methods to describe the perceived household and community food and physical activity environments in Native communities. The use of LCA allows us to understand the importance of highly interrelated variables in a wholistic manner. We included indicators for traditional food access, which is an important aspect of the food environment, particularly for rural, Native communities. Future research should expand this to look at different kinds of

traditional foods to understand the extent of this food source use. In this study, we used the perception of community food and physical activity access. Future studies can expand to include GIS-based assessments, particularly for characterizing physical activity environments. The household food environment is important to consider in addition to immediate community food environments, especially since many people travel long distances for food shopping in Native communities. Future research can use multilevel models to assess contributions of both household and community-level environments.

There are also important limitations of this study. First, this study used cross-sectional data to describe food environments and relation to BMI, limiting our ability to determine whether food environments lead to higher adiposity, however, this exploratory analysis presents a first look at this hypothesis with existing data. Statistical power to further describe classes differences was limited by sample size, particularly for BMI. This study examines the relationship between distal variables: the food and physical activity environments and BMI. Future work should examine the relationship between latent classes and more proximal outcomes such as physical activity and dietary intake data as well as examine other influence of other chronic diseases. Additional and improved indicators may be needed to get a clearer picture of food and physical activity environments of Native communities. What we observed in sensitivity analyses relating community to latent food and physical activity strongly suggests that additional and improved indicators may be needed to fully capture the Community Food Environment in Native communities. Indicators for the physical activity environment were largely aspirational and traditional foods could have been conflated to include new traditional foods, like fried bread, which are not healthy food sources. Additional indicators could

include questions about food vendors and restaurants, quality of food available, and informal physical activity groups, and use of other physical activity resources (walking paths, sidewalks, etc.).

This research adds to the growing body of work examining to the food and physical activity environments and gleans a first exploration and description of three NA communities from the Midwest and Southwest. Further research is needed to understand the health impacts of these environments and to characterize NA food and physical activity environments to identify potential levers for policy change at Tribal and institutional levels within the community.

5.6 Tables for Chapter 6

Table 6. Indicators used for exploratory latent class analyses

Household Food Environment	Community Food Environment	Community Physical Activity Environment
1. Do you or a household member receive WIC? (0=No; 1=Yes)	1. Making healthy food takes too much time (0=Disagree; 1=Agree)	1. Physical activity facilities, like a gym, are not available to me (0=Disagree; 1=Agree)
2. Do you or a household member receive snap? (0=No; 1=Yes)	2. Fresh fruits and vegetables are not available where I shop (0=Disagree; 1=Agree)	2. It is safe for me to exercise outside in my community (0=Disagree; 1=Agree)
3. Gets fresh fruit 0-4 times per month (weekly) (0) or 5 or more times per month (1)	3. I often purchase groceries from convenience stores and gas station stores near the community (0=Disagree; 1=Agree)	3. I use community facilities and services (like a community gym, fitness room) to exercise (0=Disagree; 1=Agree)
4. Gets fresh vegetables 0-4 times per month (weekly) (0) or 5 or more times per month (1)	4. In general, it is difficult to get to a store to buy food (0=Disagree; 1=Agree)	4. I would like to have more exercise options available in my community (0=Disagree; 1=Agree)

Household Food Environment	Community Food Environment	Community Physical Activity Environment
5. Gets game meat 0 times per month (0), gets game meat at least once per month (1)	5. I would purchase healthy food more often if it were less expensive (0=Disagree; 1=Agree)	5. I would exercise more if there were more opportunities, like groups, for exercise (0=Disagree; 1=Agree)
6. Gets water 0-4 times per month (0), gets water 5 or more times per month (1)	6. I go to the nutritionist in the community for advice on how to eat healthier (0=Disagree; 1=Agree)	6. I would exercise if I had the time (0=Disagree; 1=Agree)

Table 7. Study sample characteristics

	Mean (SD) or % (N)
Sample size	300
Mean age in years (SD)	46.8 (13.9)
% Female (N)	74.0 (222)
Mean household size (SD)	3.4 (1.8)
Mean number of children in household (SD)	1.2 (1.4)
Employment status	--
% Unemployed, retired or disabled (N)	22.0 (66)
% Student (N)	3.3 (10)
% Part time employee, seasonal or temporary (N)	12.3 (37)
% Full time employment (N)	62.3 (187)
Highest attained education levels	--
% Less than HS (N)	11.0 (33)
% HS Diploma/GED (N)	33.7 (101)
% Some post-secondary (N)	48.0 (144)
% Completed post-secondary and beyond (N)	7.3 (22)
Marital status	--
% Single/Separated/Widowed/Divorced (N)	203 (67.9)
% Married/Common law/Live with Partner (N)	96 (32.1)
% receiving any food assistance (N)*	183 (61.0)
% WIC (N)	12.7 (38)
% SNAP (N)	24.7 (74)

Table 7. Study sample characteristics

	Mean (SD) or % (N)
% FDPIR (N)	14.3 (43)
% Food Bank (N)	11.0 (33)
% Senior Center (N)	19.0 (57)
% Church (N)	11.3 (34)
Mean BMI (SD)	31.2 (6.2)

*Excludes rare sources of food assistance (farm and summer) (<5%)

Table 8. Exploratory LCA model fit indicators for each latent variable

Latent variable	# of classes, k	# S*	BIC	LMR	BLRT	# SR**
Household Food Environment	1	6	1996.491	N/A	N/A	15
	2	13	1904.045†	0.0000ǂ	0.0000ǂ	5
	3	20	1920.240	0.0358ǂ	0.0000ǂ	4
	4	27	1947.860	0.0615	0.6000	2
Community Food Environment	1	6	1915.484†	N/A	N/A	4
	2	13	1932.863	0.0372ǂ	0.0000ǂ	2
	3	20	1961.555	0.1018	0.6667	1
	4	27	1996.389	0.4577	1.000	1
Community Physical Activity Environment	1	6	2138.610	N/A	N/A	14
	2	13	2069.390†	0.0000ǂ	0.0000ǂ	4
	3	20	2095.437	0.1617	0.4286	4
	4	27	2128.409	0.4878	1.0000	3

*#S – number of free parameters

**#SR – number of patterns with standardized residuals >1.96.

† denotes the lowest BIC value for the latent variable

ǂ Fits significantly better than a k-1 class model

Table 9. Results of Household (HH) Food Environment latent class analysis

Indicators	Class 1 "Higher HH food access" 41.9% N=125.8	Class 2 "Lower HH food access" 58.1% N=174.2
Fresh fruit* (SE)	0.37 (0.07)	0.22 (0.05)
Frozen fruit (SE)	0.53 (0.06)	0.23 (0.05)
Canned fruit in 100% juice (SE)	0.85 (0.05)	0.49 (0.05)
Canned fruit in light/heavy syrup (SE)	0.67 (0.07)	0.29 (0.05)
Fresh vegetables* (SE)	0.35 (0.07)	0.18 (0.05)
Frozen vegetables (SE)	0.81 (0.06)	0.59 (0.05)
Canned vegetables (SE)	0.93 (0.04)	0.81 (0.04)
Beans or peas (SE)	0.84 (0.04)	0.55 (0.05)
Dried fruits or nuts (SE)	0.68 (0.06)	0.44 (0.05)
Whole wheat bread or pasta (SE)	0.93 (0.04)	0.66 (0.04)
Hot cereal, like oatmeal (SE)	0.85 (0.05)	0.63 (0.05)
Low sugar high fiber cereals, like shredded wheat (SE)	0.84 (0.06)	0.44 (0.05)
High fiber rice, like wild or brown (SE)	0.90 (0.05)	0.54 (0.05)
Poultry* (SE)	0.22 (0.05)	0.09 (0.04)
Game meat (SE)	0.63 (0.07)	0.43 (0.05)

Indicators	Class 1 "Higher HH food access" 41.9% N=125.8	Class 2 "Lower HH food access" 58.1% N=174.2
Seafood or fish (SE)	0.64 (0.06)	0.39 (0.04)
Low-fat or low sugar snacks, like baked chips (SE)	0.79 (0.07)	0.35 (0.06)
Low-fat deli meat (SE)	0.70 (0.08)	0.24 (0.05)
Cooking spray (SE)	0.65 (0.05)	0.48 (0.05)
Low-fat milks, like 1 or 2% (SE)	0.76 (0.05)	0.78 (0.04)
Skim milk (SE)	0.22 (0.05)	0.05 (0.02)
Milk alternatives, like almond (SE)	0.28 (0.05)	0.13 (0.04)
Sugar-free drinks, like club soda (SE)	0.44 (0.07)	0.17 (0.04)
Water* (SE)	0.29 (0.06)	0.13 (0.04)
100% fruit juice (SE)	0.83 (0.05)	0.59 (0.05)
Low-fat or light dressings (SE)	0.67 (0.06)	0.29 (0.05)
WIC (SE)	0.17 (0.04)	0.09 (0.03)
SNAP (SE)	0.31 (0.05)	0.20 (0.03)
Commodity Foods or FDPIR (SE)	0.20 (0.04)	0.11 (0.03)
Food Bank (SE)	0.12 (0.03)	0.10 (0.03)
Senior center meals (SE)	0.12 (0.04)	0.24 (0.04)
Church (SE)	0.14 (0.04)	0.09 (0.02)

	Class 1 "Higher HH food access" 41.9% N=125.8	Class 2 "Lower HH food access" 58.1% N=174.2
Indicators		

*Commonly gotten foods were dichotomized as getting more than weekly (5 or more times monthly) or up to weekly (0-4 times per month)

Table 10. Results of Community Food Environment latent class analysis

Indicators	Class 1 "Higher food access" 85.1% N=255.2	Class 2 "Lower food access" 14.9% N=44.8
Making healthy food takes too much time (SE)	0.27 (0.03)	0.14 (0.08)
I would cook foods using healthier methods if I knew how (SE)	0.87 (0.02)	0.45 (0.17)
Fresh fruits and vegetables are not available where I shop (SE)	0.13 (0.02)	0.0 (0.0)
I would purchase healthy food more often if it were less expensive (SE)	0.87 (0.06)	0.0 (0.0)
Traditional foods are easy for me to get regularly (SE)	0.66 (0.03)	0.82 (0.15)
I often purchase groceries from convenience/gas stores (SE)	0.34 (0.03)	0.24 (0.09)
It is difficult to get to a store to buy food (SE)	0.19 (0.03)	0.04 (0.06)
I go to the nutritionist for advice (SE)	0.24 (0.03)	0.38 (0.11)

Table 11. Results of Community Physical Activity (PA) Environment LCA

Indicators	Class 1 "Higher PA access" 71.9% N=215.8	Class 2 "Lower PA access" 28.1% N=84.2
Physical activity facilities, like a gym, are not available to me (SE)	0.23 (0.03)	0.16 (0.05)
I feel confident exercising in my community (SE)	0.78 (0.03)	0.80 (0.05)
It is safe for me to exercise outside in my community (SE)	0.84 (0.03)	0.95 (0.03)
I use community facilities and services (like a community gym) (SE)	0.45 (0.04)	0.39 (0.06)
I would like to have more exercise options available (SE)	0.88 (0.02)	0.26 (0.09)
I would exercise more if there were more opportunities like exercise groups (SE)	0.83 (0.05)	0.0 (0.0)
I would exercise if I had the time (SE)	0.76 (0.03)	0.35 (0.07)

Table 12. Study sample characteristics comparing latent variable classes of Household (HH) Food Environment, Community Food Environment, and Community Physical Activity (PA) Environment

	Overall	Household (HH) Food Environment		Community Food Environment		Community PA Environment	
		Class 1	Class 2	Class 1	Class 2	Class 1	Class 2
Class name	N/A	"Higher HH food access"	"Lower HH food access"	"Higher food access"	"Lower food access"	"Higher PA access"	"Lower PA access"
Sample size (%)	300	125 (41.7)	175 (58.3)	248 (82.7)	52 (17.3)	213 (71.0)	87 (29.0)
Mean age in years (SD)	46.8 (13.9)	44.6 (13.1)†	48.3 (14.2)†	47.3 (13.9)	44.3 (13.4)	46.3 (13.9)	48.0 (13.7)
% Female (N)	74.0 (222)	73.6 (92)	74.3 (130)	74.6 (185)	71.2 (37)	74.7 (159)	72.4 (63)
Mean HH size (SD)	3.4 (1.8)	3.7 (1.8)†	3.2 (1.7)†	3.3 (1.8)	3.6 (1.9)	3.4 (1.8)	3.4 (1.9)
Mean number of children in HH (SD)	1.2 (1.4)	1.6 (1.6)†	1.0 (1.2)†	1.2 (1.4)	1.4 (1.6)	1.2 (1.4)	1.2 (1.4)
Employment status	--	--	--	--	--	--	--

	Overall	Household (HH) Food Environment		Community Food Environment		Community PA Environment	
		Class 1	Class 2	Class 1	Class 2	Class 1	Class 2
% Unemployed, retired or disabled (N)	22.0 (66)	18.4 (23)	24.6 (43)	23.8 (59)	13.5 (7)	23.5 (50)	18.4 (16)
% Student (N)	3.3 (10)	5.6 (7)	1.7 (3)	3.2 (8)	3.9 (2)	4.2 (9)	1.2 (1)
% Part time employee, seasonal or temporary (N)	12.3 (37)	14.4 (18)	10.9 (19)	12.1 (30)	13.5 (7)	13.6 (29)	9.2 (8)
% Full time employment (N)	62.3 (187)	61.6 (77)	62.9 (110)	60.9 (151)	69.2 (36)	58.7 (125)	71.3 (62)
Highest attained education	--	--	--	--	--	--	--
% Less than HS (N)	11.0 (33)	8.0 (10)	13.1 (23)	11.7 (29)	7.7 (4)	11.3 (24)	10.3 (9)
% HS Diploma/GED (N)	33.7 (101)	32.8 (41)	34.3 (60)	34.3 (85)	30.8 (16)	31.9 (68)	37.9 (33)
% Some post-secondary (N)	48.0 (144)	55.2 (69)	42.9 (75)	46.4 (115)	55.8 (29)	50.2 (107)	42.5 (37)

	Overall	Household (HH) Food Environment		Community Food Environment		Community PA Environment	
		Class 1	Class 2	Class 1	Class 2	Class 1	Class 2
% Completed bachelors and beyond (N)	7.3 (22)	4.0 (5)	9.7 (17)	7.7 (19)	5.8 (3)	6.6 (14)	9.2 (8)
Marital status	--	--	--	--	--	--	--
% Single/Separated/ Widowed/Divorced (N)	67.9 (203)	65.3 (81)	69.7 (122)	66.0 (163)	76.9 (40)	66.2 (141)	72.1 (62)
% Married/Common law/Live with Partner (N)	32.1 (96)	34.7 (43)	30.3 (53)	34.0 (84)	23.1 (12)	33.8 (72)	27.9 (24)
% receive food assistance (N)*	61.0 (183)	66.4 (83)	57.1 (100)	60.9 (151)	61.5 (32)	61.0 (130)	60.9 (53)
% WIC (N)	12.7 (38)	17.6 (22)†	9.1 (16)†	14.1 (35)	5.7 (3)	14.1 (30)	9.2 (8)
% SNAP (N)	24.7 (74)	31.2 (39)†	20.0 (35)†	23.4 (58)	30.8 (16)	25.8 (55)	21.8 (19)
% FDPIR (N)	14.3 (43)	19.2 (24)†	10.9 (19)†	14.9 (37)	11.5 (6)	14.6 (31)	13.8 (12)
% Food Bank (N)	11.0 (33)	12.0 (15)	10.3 (18)	10.9 (27)	11.5 (6)	10.3 (22)	12.6 (11)

	Overall	Household (HH) Food Environment		Community Food Environment		Community PA Environment	
		Class 1	Class 2	Class 1	Class 2	Class 1	Class 2
% Senior Center (N)	19.0 (57)	11.2 (14)†	24.6 (43)†	19.4 (48)	17.3 (9)	17.4 (36)	23.0 (20)
% Church (N)	11.3 (34)	13.6 (17)	9.7 (17)	10.1 (25)	17.3 (9)	8.5 (18)†	18.4 (16)†
Mean BMI in kg/m^2 (SD)	31.2 (6.2)	31.6 (6.6)	31.0 (5.9)	31.0 (6.1)	32.5 (6.5)	31.2 (6.3)	31.3 (6.0)

*Excludes rare sources of food assistance (farm and summer) (<5%), †Statistically significant at the $\alpha=0.05$

Chapter 6. Sustaining multi-level, multi-component obesity prevention programs in Native American communities: barriers and facilitators identified by community stakeholders from three communities

6.1 Abstract

Multi-level, multi-component (MLMC) interventions are a promising intervention strategy for obesity prevention, and the likelihood of their success is enhanced if activities are sustained over the long-term. Prior research has not explored the factors related to sustaining these kinds of interventions in Native American (NA) communities, who experience a high burden of obesity and related chronic diseases. We explored community stakeholder perspectives of sustainability barriers and facilitators that relate to the long-term maintenance of OPREVENT2 intervention components (Store, Worksites, Schools, Media, and Coalition Meetings). We conducted 46 in-depth interviews and two workshops with Tribal Leaders, health staff, store employees, and school employees in three OPREVENT2 communities. For our analysis, we conducted two rounds of coding, one inductive round to identify emerging themes, and one deductive coding round, using a previously-developed conceptual framework by Schell et al. While the application of these nine codes was generally straightforward, our analysis provided additional clarification relevant to sustaining programs in NA communities: funding stability, organizational capacity, program evaluation, public health impact, program adaptation, communication, partnerships, strategic planning, and political support. Our analysis also found different relationships between the nine themes and more emphasis on funding stability and organization capacity themes as primary factors

related to sustainability. This analysis is the first known description of facilitators and barriers to sustaining MLMC obesity prevention programs in Native communities.

6.2 Introduction

Sustaining community-based public health interventions is a key concern for sponsors, researchers, and community stakeholders, and is an important aspect of dissemination and implementation research to ensure that public health impact is maximized. Though definitions for sustainability vary, Scheirer and Dearing have defined sustainability as "the continued use of program components and activities for the continued achievement of desirable program and population outcomes" (Scheirer & Dearing, 2011). Further, while the traditional "stages" implementation model suggests that sustainability is the last stage of implementation, such a distinction between implementation and sustainability is arbitrary and sustainability research suggests that they are contemporaneous processes (Pluye, Potvin, & Denis, 2004).

Despite the growth in sustainability research over the last 30 years, there is no agreed upon conceptual frameworks of sustainability because of a proliferation of research within specific program areas that have developed their own definitions and variables instead of tying into the larger sustainability literature (Scheirer & Dearing, 2011). Although there are many conceptual frameworks that focus on sustainability; only one of these describes factors impacting the sustainability of health programs. The conceptual framework developed by Schell, et al. describes nine domains of factors impacting sustainability: (1) funding stability, (2) organizational capacity, (3) program evaluation, (4) public health impact, (5) program adaptation, (6) communication, (7) partnerships, (8) strategic planning, and (9) political support (L. M. Schell, Burnitz, & Lathrop, 2010).

This framework was developed based on a literature review and concept-mapping with public health experts from various public health disease focuses (S. F. Schell et al., 2013). Prior to this framework, a common set of factors related to long-term sustainability in various contexts had not been developed (Scheirer & Dearing, 2011).

Sustaining community-based interventions is particularly important for impacting obesity and non-communicable disease (NCD) morbidity and mortality since behavior change takes time, requiring support and reinforcement from the environment (Shediac-Rizkallah & Bone, 1998). Native Americans (NAs) have experienced a rapid nutrition and epidemiologic transition and now face an increased burden of obesity and NCDs (Compher, 2006c). The Indian Health Service (IHS) reported that 54% of the IHS user population is classified as obese, and 27% as overweight (Indian Health Service, 2011) compared to 29.4% and 33.4% for obese and overweight among the US general population (Tables of Summary Health Statistics: National Health Survey, 2016a). As of 2014, six of the top ten leading causes of death among NAs were attributable to obesity-related NCDs (Heron, 2016). NA age-adjusted death rates from heart disease were equal to Non-Hispanic whites while diabetes was over three times higher among NA compared to NHW (Indian Health Service, 2014). Particularly for addressing weight loss, Maintaining weight loss is also made more difficult because of the decrease in resting energy expenditure that subsequently develops after both gastric restriction surgeries as well as programs encouraging both intensive calorie restriction and physical activity (Browning, Franco, Cyrus, Celi, & Evans, 2016; Fothergill et al., 2016; Knuth et al., 2015), so creating a supportive environment could help in weight loss maintenance at a population level.

The causes of obesity are multifactorial and are present at each level of the socioecological model (SEM), which describes interdependent levels of influence at the intrapersonal, interpersonal, organizational, community, and policy levels (McLeroy et al., 1988). Multilevel, multicomponent (MLMC) community-based obesity prevention programs are structured to work at multiple levels of the SEM and include intervention components that are complementary and coordinated (Mikkelsen, Novotny, & Gittelsohn, 2016). A recent review of MLMC obesity prevention interventions found that MLMC approaches are promising for achieving health and behavioral impacts and that they may have improved impact than single-level obesity interventions (Ewart-Pierce, Mejía Ruiz, & Gittelsohn, 2016). MLMC intervention approaches that encourage concerted, complementary efforts throughout the community between different sectors can reinforce the interventions and result in higher dose delivered (Gortmaker et al., 2011). The key strength of the MLMC work is its coordinated work in multiple sites throughout the community, however, the complexity of MLMC interventions makes investigating community stakeholder perspectives of the relevant factors to sustaining the program even more relevant.

Research on the long-term sustainability of obesity prevention programs in NA communities has yet to be explored. A recent case study on MLMC obesity prevention programs provided lessons learned from across three programs and asserts that the MLMC intervention approach has the potential to be sustainable, as they attend to "community needs, wants and strengths" (Mikkelsen et al., 2016). We collected data as part of the OPREVENT2 study, an MLMC obesity prevention program working with six NA communities in the Midwest and Southwest (Gittelsohn et al., 2017a). The

intervention consists of five components working with food stores, worksites, schools, community media, and policy arenas to promote access to healthy food and physical activity resources. The intervention has six phases that occur over a one-year period, with each phase highlighting different promoted foods, behaviors, activities, and communications materials. To implement Round 1 of the OPREVENT2 intervention, staff included one intervention coordinator based in Baltimore, two study coordinators overseeing intervention work in each region, and one primary interventionist in each Round 1 community. A systematic literature assessing the sustainability literature and providing recommendations for future research emphasized the need for qualitative studies examining the relationships between key drivers of sustainability (Stirman et al., 2012).

To our knowledge, there has been no research examining community stakeholder perspectives of strategies for and barriers to promoting obesity prevention program sustainability in NA communities. The OPREVENT2 trial, presents an opportunity to apply the framework developed by Schell et al. to understand the extent to which the nine themes relate to sustaining this intervention among Native communities. In addition, we aim to explore the relationship of these factors to sustaining health programs; prior research has not explored in-depth the interrelationships between the domains suggested by Schell et al. (S. F. Schell et al., 2013).

6.3 Methods

Data were collected as part of the formative research phase of the OPREVENT2 study and aimed to identify strategies to sustain the intervention activities beyond the one-year period and strategies to promote structural changes in partnership with communities. Six

OPREVENT2 Main Trial communities were randomly assigned to receive either Round 1 or Round 2 of the intervention. Two pilot communities participated in the pilot of the OPREVENT2 intervention, based on their comparison status for a previous obesity prevention trial. We used two phases of data collection in three NA communities: one pilot community in the Midwest (Community 1), one Round 1 community in the Midwest (Community 2), and one Round 1 community in the Southwest (Community 3). Phase 1 of data collection (September 2015 – September 2016) involved in-depth interviews to explore factors related to sustaining the OPREVENT2 pilot activities as well as processes for enacting environmental change in Community 1 (OPREVENT2 pilot community). Phase 2 of data collection (July 2016 – November 2017) involved in-depth interviews and workshops to confirm and clarify findings among OPREVENT2 Round 1 communities (Communities 2 and 3).

In-depth interviews. Initially, Tribal Representatives, Tribal employees, and health staff were recruited to participate in in-depth interviews in Community 1. Participants were eligible for participation if they were: over the age of 18, English speaking, and had knowledge of either health promotion activities, policy development, or policy approval processes as part of their official positions in the community. Theoretical sampling was used to identify participants for subsequent interviews in order to develop and refine emergent categories for the analysis (Charmaz, 2006). Theoretical sampling also guided follow-up interviews; eight participants (six in Community 1, 2 in Community 3) were interviewed multiple times based on the richness of first interviews and based on the clarifying and follow-up questions. In total, 46 in-depth interviews were conducted with 28 participants from three communities between September 2015 and November 2017

(Table 13). Interviews lasted between 12 minutes and four hours (mean=48 minutes), depending on the availability of participants. In Community 1, an Anishinaabe community in the Midwest region, 30 total in-depth interviews were conducted, 14 of which were conducted with six government representatives/staff, 11 with five with health staff, and five with three school administrators/staff. In Community 2, another Anishinaabe community in the Midwest region, three interviews were conducted with three government representatives/staff persons and one local store staff person. In Community 3, an Athabascan community in the Southwest region, 12 interviews were conducted with three government representatives/staff, four health staff, two store staff, and one school administrator/staff person. Digital audio recordings were collected for interviews and were transcribed verbatim. At the request of in-depth interview participants, 12 interviews with six participants were documented using typed notes only. For these interviews, notes were typed verbatim as much as possible and were expanded immediately after interviews, while tracking what text was added.

The in-depth interview guide was developed based on the team's previous work in Native communities (Gittelsohn & Rowan, 2011; Gittelsohn et al., 2012) and from the American Indian Healthy Eating project (Fleischhacker et al., 2011). Interviews sought to elicit information on the following topics: feedback on and experience with OPREVENT2 pilot activities, anticipated challenges to sustaining the OPREVENT2 activities, challenges and strategies that were experienced with sustaining existing chronic disease prevention programs (See Appendix 9.1). The interviews were exploratory, and the interviewer probed on topics that arose related to sustaining health programs, barriers to sustainability, and strategies to improve program maintenance.

Workshops. Workshops are a participatory methodology for gathering community stakeholder input for promoting participation and gathering input on intervention strategies (Gittelsohn, Roache, Kratzmann, Ogina, & Sharma, 2010). Two workshops with Tribal Leaders and health staff were conducted between August and November 2016 using methods previously described (Gittelsohn et al., 2010). We used workshops to gather feedback on the acceptability and feasibility of our overall approaches as well as to gain participant feedback on a new component promoting structural changes in each community Each workshop lasted approximately 3 hours and had three goals: (1) to understand existing programs, resources and policies promoting healthy eating and active living, (2) to identify community partners to participate in intervention activities and sustaining activities, and (3) to gather feedback on intervention strategies to tailor to the community context. We used a combination of criterion and convenience sampling for recruiting workshop participants. For criterion sampling, participants were recruited if they were Tribal Government staff (e.g., Tribal Representatives, Tribal grant writer) or health staff (e.g., health directors, dieticians, fitness instructors/trainers). For convenience sampling, flyers were also posted in community spaces to recruit additional participants interested in promoting healthy communities and drew in local school staff in Community 3. Digital audio recordings and verbatim transcripts were obtained from the workshops.

Table 14 presents participant characteristics for workshops. The first workshop, which was held in Community 2, an Anishinaabe community in the Midwest region, had eight health staff participants. The second workshop was held in Community 3, an

Athabascan community in the Southwest region, which had three participants, consisting of one health staff, one Tribal staff, and one school staff.

Data Analysis. Data analysis involved both inductive and deductive coding rounds. First, an inductive coding approach, drawing from principles of Grounded Theory (Charmaz, 2006), was used to enable the lead author to familiarize herself with the data and identify key themes. Initial coding and focused coding (Charmaz, 2006) were used to identify themes related to sustaining health programs as well as OPREVENT2 feedback. This topic was then reviewed to identify themes related to sustaining health programs. Memoing was used throughout this round of coding to understand the relationships between domains and revising definitions of the domains (Charmaz, 2006). In the second round of coding, the nine domains (i.e., funding stability, organizational capacity, program evaluation, public health impact, program adaptation, communication, partnerships, strategic planning, and political support) and their descriptions from the Public Health Program Capacity for Sustainability framework by Schell et al formed the basis of our deductive codebook (S. F. Schell et al., 2013). We coded in-depth interviews and workshops transcripts and notes, allowing excerpts to have multiple codes (Schell themes) assigned. This framework was selected based on its overall fit of the domains with the preliminary results from the first round of coding. Dedoose analysis software version 8.0.42 was used for coding and memoing ("Dedoose," 2016).

Approvals. The research protocol was approved by the participating Tribal Governments as well as the Johns Hopkins School of Public Health Institutional Review Board (JHSPH IRB), the Indian Health Service IRB, and the Navajo Nation Human Research Review Board. The JHSPH IRB deemed the formative data collection to be non-human subjects

research since data collection sought to elicit participants' opinions about their communities in general rather than collecting personal information about participants. All in-depth interview participants provided oral consent for interviews and audio recording. As part of our agreement with participating communities, community names have been obscured to protect community and participant confidentiality, though we have provided a brief description of the communities to help readers assess the transferability of our findings. Quotations have been redacted to protect the confidentiality of participants and the communities they represent.

6.4 Results

The Schell framework outlines nine themes relating to sustainability: (1) funding stability, (2) organizational capacity, (3) program evaluation, (4) public health impact, (5) program adaptation, (6) communication, (7) partnerships, (8) strategic planning, and (9) political support (Table 3). In general, these nine themes aligned well with the barriers and facilitators highlighted by participants, with additional subcodes added to the codebook for clarifications (Table 3). Allowing multiple codes to be assigned to each excerpt allowed us to explore the interrelationship between codes in each of the themes. These nine interrelated themes highlight participants' previous experience maintaining health programs as well as key factors that they foresaw in sustaining the OPREVENT2 programs in their communities.

1. Funding Stability

Funding stability was frequently mentioned by participants from all communities as a primary concern for sustaining health programs. We identified additional aspects of the

funding environments relevant to NA communities: IHS programs and services and applying for additional grants. Importantly, these funding sources had implications for the level of OPREVENT2 continuation, with participants emphasizing the need for additional grant funding to achieve sustainability at the same level of OPREVENT2 intervention or higher (to hire a full-time staff person to work on OPREVENT) and the need to work with IHS staff for at least partial continuation of OPREVENT2 program activities.

An important aspect of the funding environment for health programs in Native communities is the IHS, which provides health services for federally-recognized Tribes. However, all participants described IHS funding as insufficient and uncertain, due to the annual congressional appropriation of funds. For example, one participant described how healthcare and prevention activities were "on the chopping block" at the federal level and renewal of the Special Diabetes Program for Indians (SDPI) was uncertain. When describing how short-term projects could be sustained in the communities, participants from two communities described a process of aligning program grant staff and activities with IHS programs to incorporate services. Instability in federal funding sources like the IHS and SDPI can, therefore, impact funding for health programs and make sustaining programs difficult. Interviewees also described grant opportunities as an important resource for continuing OPREVENT2 program activities at the same level as the main intervention. However, participants noted that this required expanded institutional capacity to successfully apply, monitor, and manage the grants. All the participating communities had grants departments, however, grant applications were written by department staff as opposed to grant staff. In some situations, the Tribe provided funding

for programs; however, this depended on the availability of funds and the importance of the activities to the community.

Funding was an important upstream factor for promoting program sustainability since it impacted organizational capacity and program evaluation. Participants described how securing grant funding incentivized program evaluation due to reporting requirements. Program evaluation, in turn, increased the likelihood that the program would be sustained, both by convincing local stakeholders and funders. Funding was described as a major determinant of increasing capacity because it allowed each community to hire needed staff. We found that the funding stability and capacity themes were highly interrelated, with participants emphasizing that funding termination (whether IHS or grant funding) resulted in reduced staff and creating lower capacity.

2. *Organizational capacity*

Participants from all communities mentioned both institutional and community capacity as local barriers to sustaining programs. To participants, institutional capacity was inextricably linked to funding shortages, especially for health staff funded by the IHS. In terms of institutional capacity, participants were wary of assigning additional tasks/activities to these limited staff since it could potentially result in staff burnout and staff turnover. Health staff were concerned that this could create a cycle of capacity issues, since losing staff could create additional work for remaining staff and increase the risk of staff burnout. These staffing challenges made the prospect of participating in additional activities for sustaining OPREVENT2 during the pilot (such as training, collaborating on activities) more difficult.

Participants also expressed concern about the community's capacity in the long term and described the need to promote education and training for local community members. Promoting education among younger generations was described as a necessary step in addressing the limited capacity in the community over the long-term. Participants described their community's struggle to promote post-secondary education and training of youth. The lack of training for leadership and health roles, in turn, impacted the employment rates of the community and the ability to fill positions with local community members. The communities struggled to hire local community members in health positions and generally to fill high-level leadership positions that required extensive experience and/or high educational attainment. One promising capacity-building strategy is incorporating capacity-building in the intervention. In one site, health staff recommended that we incorporate youth programs in OPREVENT2 activities. One Tribal Representative/staff described this as a grow-your-own-leader approach to train community members to take over intervention activities.

3. *Program evaluation*

Both impact evaluation and process evaluation were described by participants as helpful in convincing local stakeholders to sustain programs. Program impact analysis was generally described as an important way to demonstrate whether a program was a good candidate for sustained implementation, however, participants primarily emphasized process-related program measures, especially in demonstrating community member participation in the program. In terms of sustaining previous health programs, participants emphasized the role of impact evaluations in applying for grant funding, although

surveillance data were rarely collected by local programs. The data that were available were collected because of programmatic or grant requirements.

In terms of process evaluation, many Tribal Representatives/staff and health staff discussed the importance of increasing the reach of existing health programs. Participants stated that this was particularly important for obesity and chronic disease programs, given the high burden in the communities. Health staff used process evaluation, especially indicators of reach (e.g., community member attendance). Process evaluation was described as one way to gauge program success and ensure accountability. Particularly in one community, health staff were interested in accessing programmatic reach data for similar programs from other communities to serve as a comparison.

4. Public health impact

Participants did not describe impact in terms of the "health attitudes, perceptions and behaviors" that Schell suggested, but participants described the importance of the perception of achieving public health impact on maintaining their own efforts to sustain activities. Participants described the overall goal of achieving public health impact as influential in sustaining staff and board members in these efforts. Participants described that burnout was frequent but that working in a group helped staff and community members to continue their health promotion work. This was particularly helpful for obesity and chronic disease prevention efforts since the community benefits were not immediate but years down the road.

A key aspect of achieving public health impact was having widespread community support and engagement. Health staff described their struggle to impact the

entire community instead of just in those in the community who were “health seekers”. Health staff described seeing the same community members access services and attend events and were unsure how to reach people who were not engaged in community events and services. Reaching beyond the health seekers in the community was particularly a struggle in promoting physical activity. Participants stated that the reach of physical fitness-related activities and programs was low, community members tended to think of physical activity as only rigorous exercise, instead of including lower intensity activities that can be incorporated into daily life.

5. *Program adaptation*

Participants from all communities described the importance of program adaptation to ensure sustained program success. In response to problems with low reach, health staff described the ongoing process of adapting health programs to sustain community participation, including offering various incentives to draw in community members. Representatives from all communities described how constant adaptation was required to maintain high participation of program activities and events. Participants described how the staff or community members oftentimes worked alone and lost energy after a few months. This “tweaking” of programs often occurred in response to informal process evaluations; if program attendance was low, then participants strategically adjusted their programs to increase community participation. Participants stated how even when activities are successful in changing behavior, it did not guarantee that those benefits will be sustained. Rather, making constant adjustments necessary to keep participants interested and materials relevant.

One strategy for keeping programs interesting and relevant was by using incentives. In general, interviewees described incentives as a double-edged sword; incentives could be a useful way to draw participants in the short term. Health staff described that incentives could help attract community members to services but that these incentives would not financially feasible in the long run. They also cautioned against potentially replacing community member's internal incentives for participating in programs motivation with these external incentives and thus potentially damaging the long-term reach of the program.

6. Communication

Participants described the important role of effective communication with both community partners and broader community members. Health staff in one community highlighted the need for better communication between OPREVENT2 staff and local staff so that the programs could better coordinate activities. During the OPREVENT2 pilot, health staff expressed confusion over its program activities and requested additional information. Health staff in this community expressed interest in recruiting community members to participate in OPREVENT2 activities. They also stated that better coordination was needed to avoid potential scheduling conflicts with similar programs activities. This scheduling conflict was particularly concerning for health staff because of its potential to reduce the reach of both OPREVENT2 and local health programs, due to the small size of the community. Communication with community partners for sustaining an MLMC program is especially complex since it involves communicating with multiple institutions, each with internal deadlines. For example, one school administrator who

decided not to have the OPREVENT2 curricula taught in their school said that the timing was a particularly sensitive for planning school curricula.

Participants also described the importance of ongoing outreach to the broader community to sustain health program. Participants stated that more intensive efforts were needed to engage community members. Health staff described the struggle to bring in community members and the need for outreach for health programs. One store staff described the importance of constant outreach was necessary to keep people interested in the activities. To address the need for outreach for existing programs and services, health staff tried to promote these resources using various recruitment strategies, like promoting programs and events using social media and radio. However, using social media created a professional challenge for health staff, since health staff felt that they could not be connected on social media because of their professional need to maintain distance from their clients.

7. *Partnerships*

Interviewees highlighted the importance of partnership with local staff and community members in all communities as a key ingredient for sustaining health programs. Partnerships with local staff were described as an important way to gain political support among Tribal Council, promote trust and program ownership. This partnership approach is especially important if program staff are not originally from the community. Participants shared advantages of partnerships, including sharing resources, promoting political support, learning new approaches to solve problems, and feeling encouraged and empowered. For example, previous health programs were successfully sustained by tackling capacity issues by building human capital in other ways and involving youth in

leading program activities. Participants also highlighted some key challenges to a partnership between program staff and local stakeholders, especially the limited institutional and community capacity and disagreements within the community. Disadvantages of working without partnership included staff burnout, and the need for dependability of program staff to build trust, especially when the program mission overlapped with those of local institutions. This overlap of missions also made partnership important so that program and local staff could work together to complement services and integrate within existing health services. In particular, local health staff described wanting to be more involved in the program so that they could assist in recruitment, plan for implementation, and especially identify strategies to sustain activities collaboratively. Participants highlighted communication as a key aspect of this partnership.

8. *Strategic planning*

Participants from all communities highlighted the need for strategic planning. Health staff from the pilot community raised concerns about the agreement between the OPREVENT2 program strategies and existing health programs, especially promoted foods and strategies to sustain programs. Health staff from the pilot community alerted OPREVENT2 staff that the foods promoted in the program did not align with the advice and guidance of local health staff, potentially causing confusion with local community members. Local staff were concerned that the OPREVENT2 program promoted artificial sweeteners during the healthier drinks phase of the program since, in their opinion, this was not a healthy drink option and that the scientific evidence was beginning to shift.

Interviewees felt that the topic of sustaining the program must be broached in a way that works to collaboratively develop solutions with local health staff so that solutions would be adapted to local needs and contexts. Health staff also described their concern about the overlap of both local health programs and OPREVENT2 efforts to promote stocking of healthy foods in local stores, as it could potentially overwhelm the local store owner and efforts to convince the store owner would collapse.

9. Political support

Participants described the need to garner political support from multiple stakeholders to sustain programs, including Tribal Council, department heads, and the broader community. To even begin working in the community, Tribal Council support is required, but health staff described that stronger support from leadership would promote program success. For example, participants described that having active engagement from Tribal Council and modeling the promoted behaviors of the programs would promote program success. They also described that a change in Tribal Council could result in barriers to sustaining the program activities in some cases.

Participants also described the need to gather support from departmental heads within the community, especially if there is overlap between the program and departmental mission. This strategy allowed staff members to collaborate if the department leader was supportive of activities via informal agreements or policy and ensured that OPREVENT2 staff were working in partnership with local staff and services. Lastly, participants described the importance of having high participation and involvement of community members. This involvement was a necessary aspect of promoting community ownership of the program. “Program champions” or advocates

were described as important to promoting both community engagement and ownership, though identifying program champions was described as difficult in the participating communities.

6.5 Discussion

This paper is the first known qualitative study examining the sustainability of health programs in NA communities. Insights from these communities were collected after two rounds of coding: one inductive approach that developed three themes from the data and a deductive approach that applied nine themes from the Schell et al framework to frame our findings. Overall, these nine themes fit well with the data, however, certain clarifications and subcodes needed to be added to improve on the general definitions provided by Schell. Important clarifications are that 1) funding – IHS presents a key aspect of the funding environment. Additional efforts should be made to provide capacity building in terms of grant writing.

Our research provides more detail on the themes related to sustaining programs in Native communities and highlights the interrelationship between these themes. Schell used concept mapping to develop an understanding of the domains, with their position and distance relative to each other demonstrates conceptual similarity (S. F. Schell et al., 2013) (Figure 4). In our analysis, we found different relationships between the nine domains based on the overlap of assigned codes (Figure 5). Contrary to the Schell framework, we found that funding stability and organizational capacity were highly related and important upstream factors related to sustainability (S. F. Schell et al., 2013)(Schell). Like Schell, we also found that the public health impact, surveillance and evaluation, and program improvement themes were highly related. Lastly, and contrary to

what was described in by Schell, we found that Communications, Partnerships, Strategic Planning, and Political Support were interrelated in this analysis. For example, it was difficult to distinguish an instance as being purely about partnerships, especially when frequent communication and garnering political support are part of the partnership process.

There are important strengths and limitations to consider when evaluating the results of this study. First, this research examines community stakeholders' perspectives of anticipated facilitators and barriers related to sustaining the OPREVENT2 programs while the intervention activities were either beginning or underway, making the discussion about sustaining the program activities hypothetical. The disadvantage of conducting these interviews is that the impact of the OPREVENT2 program has not been established, though we have indications that OP1 was effective. The timing of this data collection is important to consider because different barriers and facilitators may become more prominent at different stages of the sustaining health programs. However, we felt that the analysis was enriched by asking participants about experiences in sustaining previous community programs since differences between different kinds of health programs are minimal (Scheirer & Dearing, 2011). Previous sustainability researchers have also emphasized that this process of promoting sustainability should begin at an early stages of program planning and implementation (Shediac-Rizkallah & Bone, 1998). Future researchers should consider collecting data at pre-intervention, midway, and post-intervention to explore the changes in these nine factors over time and to explore the relative importance of these factors at various timeframes. Another limitation is that this research took as a given that program activities, to some extent, should be sustained, and

did not delve into the ethical considerations of sustaining health programs generally and OPREVENT2 specifically. Scheirer highlights the importance of this ethical question and future research with Native communities could take this perspective (Scheirer & Dearing, 2011). Lastly, this analysis was strongly informed from data collection in community 1, based on the amount of time and number of interviews collected in this community, while communities 2 and 3 were used to confirm findings. Therefore, transferring these findings to other communities may be limited; however, we think that the findings, particularly around funding and capacity, are particularly pervasive among Native communities, based on feedback from participants. Lastly, this research was conducted with three rural, federally-recognized Tribes and so the extent to which these findings apply to urban Native communities, as well as state-recognized Tribes, may be limited, particularly given the differences in community structure and services available to these communities.

One of the key findings of this research is the important roles of funding and community capacity in promoting sustainability of public health interventions. IHS services and staff impact the ability of Native communities to adopt new evidence-based practices and innovations; yet IHS services have been consistently underfunded (IHS receives approximately 50% of funding as health services for other US populations), despite treaties guaranteeing health services in exchange for land use (Warne & Frizzell, 2014). Additional advocacy and research are needed to promote the adequate funding of IHS funding, per treaty obligations. Second, there is a notable overlap of the concepts of the Schell framework and those of Community-Based Participatory Research (CBPR). This research implies that sustainability must be achieved through partnership.

Developing programs that are sustainable over the long-term is also an important outcome of CBPR (Belone et al., 2016). CBPR, compared to other research paradigms, emphasizes community involvement, ownership, and capacity, in order to achieve program maintenance (Israel, Eng, Schulz, & Parker, 2013; Minkler & Wallerstein, 2008). CBPR also has the advantage of improving research quality, community engagement, and local ownership of the research and its activities (Gittelsohn et al., 2003; Makosky Daley et al., 2010). Engaging community partners is particularly important, given the history of Native people and health research. Thousands of research projects have been conducted in Tribal Nations over the last 20 years, and yet these populations have rarely resulted in health improvements, which is problematic for many reasons (Perry & Hoffman, 2010). Future research should investigate the use of CBPR in addressing broadly the effectiveness of using this research approach to overall program sustainability and specifically addressing the nine key factors put forward by Schell et al.

Though the research on sustainability is a growing field, there is relatively little examination of the unique factors relating to sustaining health interventions and disseminating research for Native communities. This is an important gap to address since Native communities are often studied and want to see both the benefits of these programs and see sustained engagement of researchers themselves. Future interventions with Native communities should explore strategies to address barriers and promote facilitators to ensure long-term health benefits for this population.

6.6 Tables for Chapter 5

Table 13. In-depth interview participant characteristics by community

Community (Region)	Participant groups	No. of Interviews	No. of participants
Community 1 (Midwest)	- Government representatives and staff	14	6
	- Health positions	11	5
	- School administrator and teachers	5	3
	- Subtotal (Community 1)	30	14
Community 2 (Midwest)	- Government representatives and staff	3	3
	- Store staff	1	1
	- Subtotal (Community 2)	4	4
Community 3 (Southwest)	- Government representatives and staff	3	3
	- Health positions	6	4
	- Store staff	2	2
	- School administrator and teachers	1	1
	- Subtotal (Community 3)	12	10
	- Total	46	28

Table 14. Workshop participant characteristics by community

Community (Region)	Participant groups	No. of participants	Total no. of participants
Community 2 (Midwest)	Health staff	8	8
Community 3 (Southwest)	Health staff	1	3
	Tribal staff	1	
	School staff	1	

Table 15. Table 3. Overview of themes, additional subcodes, and supportive quotes

Themes and description	Additional subcodes	Supporting Quotes
1. **Funding Stability – "**Making long-term plans based on a stable funding environment" (S. F. Schell et al., 2013)	- Funding sources: IHS, external grants - Key strategy: pairing with programs with similar missions	"if we find something that is valuable at the health center, we start tying it into our other programs…So that if the grant goes away next year, we see the IHS funding there does support what that person's been doing."– Health staff "The bad part of that is that sometimes when grants are done, the program and the employees then go away too." – Health staff
2. **Organizational Capacity – "**The resources needed to effectively manage the program and its activities" (S. F. Schell et al., 2013)	- Community capacity - Staff turnover - Expanding staff roles	"Capacity [is an] issue…We're pretty much at the limit of what we can do staff-wise. Everybody has enough projects that more would make it less almost because [we] wouldn't be accomplishing what you want." – Health staff "Those are some of the things that Tribes really struggle with - getting their people educated, getting them [a] good

	- Training next generation of leaders	job and…one can't be accomplished without the other." – Tribal Representative/staff
3. Surveillance and Evaluation (program evaluation) – "Monitoring and evaluation of process and outcome data associated with program activities" (S. F. Schell et al., 2013)	- Demonstrating program impact to support sustained work - Importance of process data and reach of programs	"I would think there is [a way to keep OPREVENT2 going]. Especially if it proves to be a program that's working for everyone and everyone wants to see it continue, then I would think that someone could do a grant or work on that while you're doing all of that." Tribal Representative/staff "When we're this small of a community and you only get a [small] percentage of people that…use your services…I always feel like we're not reaching everybody, but I'm not sure if you break down the numbers, if our percentage of people that are reached is maybe the same as a larger community." – Health staff

4. **Public Health Impact – "**The program's effect on the health attitudes, perceptions, and behaviors in the area it serves" (S. F. Schell et al., 2013)	- Strong community engagement - Impacting the entire population	"A lot of times the benefits of a program…lasts longer than the actual program itself, it changes, it does change people's attitudes and it's educational to tribal people. So, the benefits are still there. We may not have a physical person working within the program, but the effects are still there". – Tribal Representative/staff "Sometimes [health seekers] aren't the people you want, though. Because sometimes you want the people that you don't ever see. Because…if you have people who are always coming to your groups, they're health-seekers…and they're already involved, then there's a whole population of people that we don't see. And then the question becomes, why don't we see them?" – Health staff

5. **Program Improvement (adaptation) – "**The ability to adapt and improve to ensure effectiveness" (S. F. Schell et al., 2013)	- Need for constant renewal of programs - Use of incentives	"We've done a lot of things that just…don't work. Like we'll start a program…that will fizzle, and it will fizzle quick. So [t]hen we take the approach that we just come back…modify it and try it again" – Health staff "I think that [varying materials] helps in the same regard as…displays in the grocery department. If you have the same item in the same display for months…on end, it sort of just becomes part of the scenery….It's amazing sometimes when you move the same item…to a different part of the store and display it differently…it keeps it fresh in people's minds" – Store staff
6. **Communications – "**The strategic dissemination of program outcomes and activities with stakeholders, decision-makers, and the public" (S. F. Schell et al., 2013)	- Need for coordination of OPREVENT2 and local activities	"… there's gotta be a way that…if [Interventionist is] doing activities, that we know what they are...and then we can help support it...If [Interventionists] are [doing] the same kinds of things that we are doing…to not have two of the same things going on." – Health staff

	- Ongoing outreach to encourage community participation	"What we lack the most in our health programs is outreach to everyone…so I always feel like we're not reaching everybody." – Health staff
7. **Partnerships – "**The connection between program and community" (S. F. Schell et al., 2013)	- Important for garnering political support - Key strategy when staff are not from community	"If we implement this program according to policy, are we stepping on anyone's toes? Are we duplicating services? Are we offending anyone? [Or] implying that people aren't doing their jobs? Could put supporters in an awkward position to answer questions. Workers fight over roles." – Tribal Representatives/staff "[working with departments in community helps] and not just resources wise too, but also manpower…and then everybody kinda knows what the other person's doing." – Tribal Representative/staff

8. **Strategic Planning – "**The process that defines program direction, goals, and strategies" (S. F. Schell et al., 2013)	- Decision of intervention scope and direction - Avoiding competing messages - Identifying local strategies to promote sustainability	"I think how [sustainability topic] came up…was like, 'oh you're going to be able to do my job for me, or you're going to be able to do what I'm doing when I'm not here' Which is not gonna…Probably be [possible]" – Health staff "And I like the fact that [OPREVENT2 interventionist]'s talking to [store owner]…I also wonder then…cause…one of his e-mails said, 'You have to remember, this is not a grocery store'…I'm like 'ahhh, if he's got me e-mailing him…and she's going in there trying to get bread on the shelf, I can see…maybe it's too much…but on the other side, maybe this…could be perceived as increased demand…But yea, I guess I…wasn't sure what…the end goal is. " – Health staff

9. **Political Support** – "Internal and external political environment which influences program funding, initiatives, and acceptance" (S. F. Schell et al., 2013)	- Primary step when working in Native communities - Impact of changing Tribal Council and priorities - Importance of demonstrating partnership	"And then just showing the community working together…And you're sharing resources, you're sharing people and then everybody kinda knows what the other person's doing…Showing that you're networking, you're working together [with other departments helps to get Tribal Council support]." – Tribal Representative/staff "I think the challenge is once you get the funding, who's going to manage the program. The types of program that you're talking about, with interventions with multiple different agencies, it takes someone with a high level of commitment, high level of commitment." – Health staff

Chapter 7. Conclusions

This chapter will describe the overall conclusions of this dissertation (including but not limited to papers 1, 2, and 3), as well as the study implications, strengths and limitations, lessons learned, policy linkages, and future research.

7.1 Summary of main findings

The goals of this research were to 1) identify strategies to promote structural changes in partnership with Native American (NA) communities, and 2) promote sustainability of OPREVENT2 program activities beyond the intervention period. To achieve these goals, I developed three aims and will revisit each of these aims, reiterate the main findings of each paper, and describe the extent that each aim was achieved.

Aim 1: *Develop a conceptual framework describing the processes for developing policy, systems, and environmental (PSE) changes in NA communities.*

In Chapter 4, we used a modified Grounded Theory methodology to develop a conceptual framework describing how PSE changes occur in three NA communities. We used in-depth interviews, modified talking circles, community workshops, and direct observations to understand this phenomenon. Participants in our data collection included Tribal Representatives and staff, health staff/board members, store managers/staff, and school staff. Prior to our data collection, we had anticipated that Tribal Council Representatives were central to the development of PSE changes in their communities. However, our findings challenged that assumption, since Tribal Council Representatives looked to local health staff for their expertise and were largely involved in the approval and endorsement of these changes. Health staff and board members were very influential in terms of identifying and developing PSE changes when there existed a strong

relationship between Tribal Council and health department leaders. Understanding the relationship between health departments and Tribal Governments and communities is important before engaging in this work since this may indicate the extent that health staff can advocate for these changes. Though we anticipated that Tribal health policies were infrequently enacted, what was unexpected was the ways in which health staff and grant writers worked across departments to leverage existing initiatives, funding, and approvals to achieve PSE change. Participants emphasized that community engagement was a necessary input for developing PSE change, suggesting an important role for grassroots collaboration with local community members, as well as with health and grant writing staff. Relevant contextual factors impacting the overall processes for developing PSE changes included historical trauma, perspectives of policy, "tribal politics", and insider/outsider voices. PSE changes generally go through a similar approval process: problems are identified by community members and/or health staff, which are then approved by local health departments/boards and subsequently approved by Tribal Council. This is the first known paper to explore the processes for developing PSE change in NA communities, which is an important gap to be addressed if structural changes are to be explored and enacted in these communities. Our conceptual framework provides a basis for understanding the processes and actors that may be involved in promoting PSE change in Native communities and serves as a foundation for additional exploration and intervention development.

Aim 2: *Conduct latent class analysis to identify and describe the household- and community-level food and physical activity environments of participating NA communities*.

In Chapter 5, we hypothesized that the NAs heterogeneously experience Household Food Environment, Community Food Environment, and Community Physical Activity Environment, and should be described by more than one subgroup based on the patterns of their responses to food and physical activity access questions from OPREVENT2 baseline data of the three communities. This was supported by our exploratory latent class analysis, which found that two-class models more effectively reflected the study sample than one-class models in depicting the Household Food Environment ("higher" and "lower household food access"), Community Food Environment ("higher" and "lower food access"), and Community Physical Activity Environment ("higher" and "lower physical activity access"). Reported access to fresh food is poor, however, participants reported that traditional food access was moderate, indicating the importance of this food source for NA populations. Key access barriers to healthy eating included affordable choices and exercise opportunities.

We also hypothesized that these subgroups would be related to BMI, however, due to sample size issues (i.e., uneven distribution of participants between classes), we were unable to further describe the sociodemographic and BMI differences between classes of the Community Food Environment and Community Physical Activity Environment. However, for the Household Food Environment, the subgroup with lower food access tended to have significantly higher age, smaller household size, fewer children in the household, lower educational attainment (an indicator of socioeconomic status), and lower participation in food assistance programs. Future research should work to increase household food access for these subgroups, potentially through promoting local transportation to nearby grocery stores or traditional food programs to ensure that

community members are receiving nutritious, fresh foods. Higher and lower household food access groups did not significantly differ by mean BMI, however, the group with higher household food access had higher BMI (31.6 compared to 31.0 in the lower access group), though this difference was not statistically significant. Future research should examine the relationship between access groups and food intake.

This analysis is the first known study to utilize latent class analysis to describe perceived household and community-level food and physical activity environments in Native communities. Our analysis included many indicators of the food access which are relevant to NA populations, including transportation, cost, traditional food access, and food assistance participation. This analysis demonstrates the utility of latent class analytic methods for describing the food and physical activity environments of NA communities, particularly given the range of food sources for this population.

Aim 3: *Describe the barriers and facilitators to sustaining OPREVENT2, an MLMC obesity prevention program, in NA communities*.

Chapter 6 of this dissertation aimed to explore community stakeholder perspectives of the barriers and facilitators that relate to the long-term maintenance of OPREVENT2 intervention components working in local food stores, worksites, schools, media, and monthly coalition meetings. We conducted in-depth interviews and workshops with Tribal Leaders, health staff, store employees, and school employees in one pilot and two Round 1 communities participating in the OPREVENT2 study. For our analysis, we conducted two rounds of coding, one inductive round of coding to identify emerging themes and familiarize with the data related to the research question, and one deductive coding round, in which we applied the conceptual framework domains described by

Schell et al. (S. F. Schell et al., 2013). While the application of these nine themes using the domains and corresponding definitions described by Schell et al. was generally straightforward, our analysis provided additional clarification relevant to sustaining programs in NA communities. Here we briefly describe the factors associated with sustainability:

1. Funding stability – key resources for sustaining programs included aligning with Indian Health Service programs and staff as well as applying for funding within and external to the Tribe, though there are implications for the extent of program continuation for these resources.
2. Organizational capacity – while participants highlighted the organizational capacity of health staff, they also emphasized the need to promote community capacity, by educating youth or working with other community volunteers to sustain activities.
3. Program evaluation – participants described that demonstrating impact was generally important to sustaining programs but emphasized the importance also of process evaluation measures for activity maintenance as they indicated community engagement.
4. Public health impact – interviewees did not frequently mention attitudes, behaviors or perspectives suggested by Schell et al.; however, several participants described the importance of seeing community and individual impact due to their efforts as influencing their own ability to continue health programs, which presents a departure from the Schell definition.

5. Program adaptation – Participants described frequent program adaptation as necessary for keeping community members engaged in activities.
6. Communication – Participants underscored the need for improved communication between OPREVENT2 staff specifically and the importance of outreach to community members to maintain interest in activities more generally.
7. Partnerships – Overlapping with communication themes, participants also emphasized the need for partnership with local community stakeholders to develop trust and local ownership of the program and build political support.
8. Strategic planning – Community stakeholders requested more collaboration and involvement in strategic planning of OPREVENT2 activities and for sustaining the program.
9. Political support – Maintaining political support from multiple groups is foundational to sustaining health programs in NA communities. Support from multiple groups is necessary, including Tribal Council, department leaders and staff, and the broader community.

This analysis is the first known description of facilitators and barriers to sustaining MLMC obesity prevention programs in Native communities. In our analysis, we found different relationships between the nine themes from Schell, et al (S. F. Schell et al., 2013). Contrary to the Schell framework, we found that funding stability and organizational capacity were highly related and important upstream factors related to sustainability. Like Schell, we also found that the public health impact, surveillance and evaluation, and program improvement themes were highly related. Lastly, and contrary to what was described in by Schell, we found that Communications, Partnerships, Strategic

Planning, and Political Support were interrelated in this analysis. These different relationships may reflect different priorities of factors in sustaining health programs in NA settings. Further exploration is needed to understand how the relative importance of these factors change over the course of program implementation.

7.2 Linkages between findings and OPREVENT2 Intervention development

The findings presented in the three papers guided the development and implementation of the OPREVENT2 Community Action Component (CAC), which I have led the development and implementation of this intervention component. As part of the intervention activities, the CAC is currently working with Round 1 communities to develop PSE changes to support healthy lifestyles and encourage OPREVENT2 sustainability. In each Round 1 community, we established monthly CAC meetings with community stakeholders, emphasizing participation from health staff, Tribal staff, Tribal Representatives, as well as the community at large. These monthly meetings were designed to vary in format, based on the interest of attendees, and have covered topics including store-based strategies to increase sales and stocking of healthy foods, promoting physical activity and healthy food access in local schools, and strategies to promote worksite wellness. An important aspect of this intervention work is to maintain flexibility. Our team was flexible in terms of meeting time, location, and topics. We also offered opportunities for capacity building seminars on topics of interest, including grant writing and research evaluation. These CAC meetings are ongoing through the Fall of 2018 in Round 1 communities, and its implementation has led to the development of lessons learned, which will be described in a subsequent section. Prior to the start of CAC meetings, our team reviewed the literature for PSE changes supporting healthy eating and

physical activity to develop a "policy menu". This menu has been used as a guidance document for providing an overview of promising PSE changes that could work to promote healthy eating and active living.

7.3 Strengths and limitations

OPREVENT2 is innovative in its intervention strategy that integrates activities at multiple levels, including structural change, food stores, worksites, schools, and community media. The research papers from this dissertation also address key gaps in the obesity prevention literature. Paper 1 is the first analysis to describe the processes for developing PSE changes in NA communities. Paper 2 is the first known paper to use Tribally representative data to describe potential food and physical activity environmental changes. Lastly, Paper 3 is the first study to describe facilitating and impeding factors related to sustaining an MLMC obesity prevention program, OPREVENT2. These papers represent key findings in developing, identifying, and sustaining obesity prevention and structural change work in NA communities, a population that experiences a high burden of obesity and related NCDs.

This study has several strengths and limitations which are important to consider when evaluating its findings and its broader implications. *Strengths*. There are several significant strengths of this research. First, the communities participating in this research (Communities A-D) are diverse in terms of government structure, Tribal affiliation, and region, which enhances the potential transferability of our findings. Second, the iterative approach to data collection allowed in-depth exploration of phenomena in one pilot community and then to explore the applicability of earlier findings to additional NA communities. Such a data collection strategy allowed us to collect rich data related to

both sustainability and PSE change development that was beneficial to our qualitative analyses. Third, pilot communities were very progressive in their efforts to promote structural changes in their communities which allowed for a richer understanding of how PSE changes can be achieved through a variety of mechanisms, and the conceptual framework development greatly benefitted from this richness. Fourth, member checking allowed us to evaluate the credibility of the conceptual framework developed for aim 1. Fifth, given the paucity of such data from NA communities, the OPREVENT2 dataset provided a unique opportunity to explore and describe food and physical activity environments in these settings, and to identify areas for structural changes. Sixth, the use of LCA provided a strong basis for exploring the complex food and physical activity environments of OPREVENT2 communities from community member perspectives. Seventh, triangulating methods and participant groups (papers 1 and 3) helped us to get a more nuanced understanding of processes related to developing structural changes and sustaining obesity prevention work in NA settings. Lastly, the emergent study design allowed for the exploration of community stakeholders' perspectives, potentially avoiding prescriptive interventions which may be inappropriate for each context.

Limitations. Along with these strengths are important limitations for consideration. First, this dissertation research did not utilize data from three Navajo communities participating in the OPREVENT2 pilot and main trial due to complexities in data use agreements. However, we feel that this did not impact the results of our analyses, since the Navajo Tribal Government is distinct in its Tribal Government structure and size and would not be representative of other Tribal Governments. Second, the extent to which the developed conceptual framework describing developing structural changes is

applicable to other Tribes has not been fully explored in this research. Given the number and diversity of Tribal Nations, it is likely that there will be variations from the presented conceptual framework; however, we believe that this framework provides a useful overview and starting point for intervention and research in other Tribal Nations and communities and our strong documentation of community characteristics enhances opportunities for transferability. Third, use of LCA to understand subgroups related to food and physical activity environments is inherently context-specific (since latent class membership depends on data collected), making application of these results to other communities questionable, and emphasizes the need to explore the use in other NA settings. Fourth, although we were able to demonstrate that multiple classes were useful in describing food and physical activity environments in NA communities, improved indicators must be identified to enhance the characterization of these environments. Fifth, while we were able to identify key barriers and facilitators to promoting sustainability of OPREVENT2, the data were collected during the early stages of intervention work and the relative influence of these factors may vary at different points of promoting sustainability. Lastly, although we conducted additional interviews in main trial communities, it was not to the same extent as the fieldwork and engagement that was done in pilot communities and hindered the development of CAC meetings for the main intervention trial.

7.4 Lessons learned for future practice and intervention implementation

Based on the findings of this research as well as the implementation of the OPREVENT2 CAC intervention, we outline lessons learned for future research and interventions aiming to develop structural changes in NA communities.

1. Balance dose delivered with reach

Whenever possible, monthly CAC meetings were planned to collaborate with existing groups/meetings to enhance reach. When a partner group could not be identified, we established and organized CAC meetings that were independent of other events. Our intervention team felt that this approach would increase chances of sustainability and would enable us to work with existing groups of community members. However, in two communities, there was no obvious community meeting or organization that we could partner to host these CAC discussions, though we at times presented on other community meeting agendas, like health staff or school board meetings. In one community, monthly Tribal Government meetings were one of the few opportunities where the community would attend. Although our intervention team tried to schedule independent meetings to allow in-depth discussion, we decided that it would be better to have consistently high attendance through these Tribal Government meetings than to meet our standards for monthly meeting length (≥60 minutes). In sites where independent meetings were established, the monthly CAC meetings have had lower attendance (attendance high standard ≥10 people). We noticed that the extent to which the community regularly comes together to discuss community issues varies in each community, and this is an important consideration for embarking on this work.

2. Designate facilitators for local meetings and build capacity of local staff.

While the OPREVENT2 intervention team is dedicated to their work, the addition of the CAC facilitation and leadership duties have been a difficult addition, given the other intervention activities that they led in food stores, worksites, schools, and community media. Previous research has used monthly CAB-style meetings to promote PSE changes

in Native communities (A. K. Adams et al., 2012). Part of the decision to use monthly meetings also came from being cognizant of interventionists need to balance CAC intervention activities with these other intervention components, all while achieving high standards for intervention delivery. We also, to some extent, asked that interventionists become knowledgeable about PSE changes and facilitating participatory meetings with community stakeholders, in addition to becoming experts in the program's other content in nutrition and physical activity. Although we provided training to the interventionists to prepare them for CAC work, this represents a sizable amount of work and expertise to expect from our staff. Ideally, bringing in either the CAC lead or OPREVENT2 PI would be an effective way to manage CAC-related tasks, however, the cost of traveling to Round 1 communities made this regular travel infeasible. While we explored the possibility and acceptability of having the CAC lead attend meetings by phone or by teleconference, this also was not feasible in our remote communities.

This also had implications for the format of monthly meetings. For participatory research, presentations can stifle discussion and entrench power dynamics, where the researchers/presenters are serving in the expert role. However, because of the amount of work required by interventionists, and to present previously tested PSE changes, PowerPoint presentations were used more frequently to present the information in a way that would minimize facilitator/interventionist burden and deliver the details of PSE change information in an accurate way. This presents an important consideration for power dynamics and the level of engagement of participants. Ideally, facilitators should be designated and have CAC work be their sole responsibility in each region, however, given funding constraints this was not possible for the OPREVENT2 intervention.

3. Understand relationships between actors when developing community stakeholder engagement strategies

Assessing the existing levels of social cohesion and collective efficacy are an important consideration for this work. Since structural changes often involve multiple sectors, the relationship between these sectors, especially between the health staff and Tribal Councils, are important to assess to gauge readiness for coalition work. It is likely that the participation and buy-in of representatives would be necessary to achieve many PSE changes. For example, working to promote traditional food access in schools could potentially require input and buy-in from school administrators, dietitians, cultural departments, local producers/growers/hunters, as well as cafeteria staff. However, if the community does not typically work in this way, working to make PSE changes within institutions could be a flexible approach to moving forward in ways that are locally acceptable and not disruptive.

4. Develop and pass a Tribal Resolution to establish monthly CAC meetings

Though the OPREVENT2 project has received Tribal Council approval via Tribal Resolutions for the overall program, additional Tribal Resolutions clarifying and establishing the role of CAC activities could help legitimize these efforts and encourage and potentially incentivize participants to participate. For example, a Resolution could include language, requiring representatives from Tribally-owned stores, Tribal Government human resources, grant writers, and health department, to attend regularly, making this part of their responsibilities. However, as with any kind of policy development, enacting this policy does not guarantee strong implementation. With this structure, the Tribal Council-established coalition could provide regular progress reports

and provide recommendations for local PSE changes to promote health and wellness to Tribal Council, based on community needs and assessments.

5. Assess community readiness for PSE change

Prior to implementing OPREVENT2 CAC, assessing community readiness could be useful in determining a path forward for promoting PSE changes that are tailored to each community. For example, while some communities may be ready to undertake something as impactful as a soda tax, for other communities it may be more effective to generally discuss ways to promote traditional foods. In these examples, both communities generally agree that obesity and chronic disease is a problem, but as a community, they may not be ready to take action, like a soda tax. Assessing community-level readiness could highlight an overall trajectory so that intervention components could be tailored to the community's stage and the needs. Especially with participatory approaches, it is important to meet communities where they are, since PSE changes that are infeasible are unlikely to be enacted. One study, by Jernigan et al., conducted a survey of NA community stakeholders to assess community feasibility and readiness to address obesity using policy approaches, and identified that both communities were in the preplanning stage (Blue et al., 2016). Incorporating such approaches are promising for developing tailored interventions that address community needs.

6. Clearer communication about PSE changes for CAC recruitment

One challenge is drawing in participants to CAC meetings. CAC flyers and materials were somewhat general in terms of CAC and descriptions of the activities, in an effort to draw in a larger amount of community members. However, the limitation of such an approach is that participants may not feel engaged to attend if the topic is too broad (e.g.,

promoting healthy food in schools). Gathering a list of topics that people would be interested in as part of formative research with communities would be useful towards promoting engagement in monthly meetings. Communication about such a new component is central to its success, especially when these efforts are led by researchers from outside the community. There is a growing food sovereignty movement across Native America, and messages could consistently use this terminology in meetings and in media. Framing this obesity and chronic disease issues as a food industry may also be beneficial for promoting healthy NA communities.

7. RCT design is inappropriate for work in NA communities

A larger question is the appropriateness of the RCT design for evaluating health programs in NA communities. Dickerson et al. describe the challenges of conducting this kind of research in NA settings (Dickerson, 2008). Using RCT design to implement a CAC component also is an area of concern. Since policy development occurs over the course of several years, the ethics of starting a project with such large ambitions is challenging, especially when policy development can occur over the course of years and not months. This brief intervention can also leave Native interventionists caught with looming promises of structural changes.

8. Having flexible process evaluation measures

Such a PSE change approach in Native communities necessitates an approach that embraces community-based participatory research (CBPR) since multiple actors from different sectors within each community must be engaged and because our research team was not from the local communities (Minkler & Wallerstein, 2008). A hallmark of CBPR work is its flexibility towards community partners' needs (Minkler & Wallerstein, 2008).

This presents a somewhat methodological challenge for monitoring this work since the flexibility of the approach precludes setting clear implementation standards. The CBPR approach means that process evaluation and standards must also be flexible. Future research will need to explore the standards that will achieve an impact, including meeting frequency, meeting length, attendee composition, and necessary inputs.

7.5 Implications for future research and methodology

Based on the analyses presented in this dissertation and the implementation of OPREVENT2 CAC activities, we describe implications to advance the research topic of developing structural changes in Native communities.

I would argue that it is important to have a broad view of structural changes for health promotion in Native communities that includes policy, systems, and environmental change (and does not solely focus on policy change). While structural changes are the intended population impact, this impact can be achieved via either policy, systems, and environmental changes. Promoting this variety of strategies can be helpful in NA communities since trust must be developed to develop policies. Having a broad view also is more realistic to what is occurring in Native communities. Partnerships between universities/researchers and NA communities could be useful in exploring and evaluating future efforts to promote PSE change in NA communities, as has been used for OPREVENT2. For these partnerships to occur, there needs to be additional sponsor funding for CBPR with Native communities for long-term projects. These long-term relationships will have the potential to overcome persistent challenges like diabetes prevention in Native communities. However, additional training in CBPR methods is needed as part of public health research training institutions, since this is foundational to

developing PSE changes in NA settings. Use of CBPR methodologies is important, given the complicated causes of obesity and chronic disease. Foucault would caution health experts not to overinflate their positions of power and expertise, especially when the evidence for recommending solutions is incomplete (Foucault, 2006). Use of CBPR approaches for community engagement can ensure that there is a balance between community member and researcher perspectives while empowering communities to promote access to healthy food and ensure active living as part of daily life.

Food policy councils present an opportunity for expanding this work. Though food policy councils are proliferating across the country, there are few in NA communities. The Center for Livable Future's Food Policy Network project works directly with food policy councils to provide support and capacity building (Center for Livable Future, n.d.). As part of this work. They also track active food policy councils and only one of the FPNs is listed as working in tribal settings (Center for Livable Future, 2015). Additional reporting is needed to record the efforts being pursued by Tribes. Organizations like the National Congress of American Indians and Seeds for Native Health conference can be key collaborators in this work, by connecting with Tribes to develop and create a network for promoting food sovereignty across Native America.

Chapter 8. Appendices

8.1 OPREVENT2 Formative Research In-Depth Interview Guide

OPREVENT2

Form 1: Tribal Leader In-depth Interview Guide

Date: ___/___/___

Purpose of this interview:

I am working with OPREVENT, an obesity prevention program which is currently underway in your community. We are interested in learning about how we can keep OPREVENT programs going in the community and how the community's environment affects tribal members' healthy eating and physical activity. The community's environment includes community resources and the physical parts of where people live, work, and go to school.

You have been chosen to participate in the interview because you are a local leader, help to make decisions like developing resolutions or policymaking in the community, or are a worksite/store/school manager. During the interview, I will ask you about tribal, worksite, or school policies that are in place to promote health and wellness in the community, existing health and wellness programs in the community, and ways the community is trying to change the built environment. As we all know, there are rules that we all go by in any community, like in the workplaces, schools, community centers, and within families, for example – we are interested in learning about these. I will be asking

you about how decisions and rules are made in your community and how these rules help to keep people healthy. I will be asking about your ideas regarding how things could change to make the community healthier and how we can help.

I will not be asking you personal questions, only about your experiences as (position), your opinions about the environment, and how health programs can be sustained.

Please answer the questions to the best of your ability. There are no right or wrong answers. Everything that is being spoken here is considered confidential and your name will not be written in any reports.

- What has been your experience participating in the OPREVENT program so far?
    - Probe: activities related to specific site.
    - What challenges (hardships) have you experienced related to the program activities?
    - What has helped you to participate in the program activities?
    - What challenges (hardships) do you foresee your site having when the OPREVENT program has ended?
    - How can OPREVENT staff address these challenges?
- Please describe an existing chronic disease prevention programs/event/initiative in the community?
    - What led to the development of this program/event/initiative?
    - What has helped the program to keep going?
    - Describe some of the challenges in keeping this program going.
    - What has made this program successful?

- Please describe community resources that influence healthy eating and physical activity?
    - Probe: What are community resources that allow you to be physically active?
    - Probe: What are community resources that make it difficult to be physically active?
    - Probe: What are community resources that allow you to eat healthy foods?
    - Probe: What are community resources that make it difficult to eat healthy foods?
- Tell me about any activities that are being done to improve community resources for healthy eating and physical activity?
- Please describe how decisions and rules are made in your community.
    - Probe: How are resolutions developed?
    - Probe: How are school/worksite/store policies developed?
    - Please describe any rules/resolutions/policies in place to promote health in the community/site.
- Please list/describe the health priorities of the community.
    - Probe: what are the most important health issues in the community?
- Who else should we talk to in the community that is involved in changing the built environment?
    - Probe: What groups? Board? Individuals?

8.2 OPREVENT2 Adult Impact Questionnaire

OPREVENT 2

Form 5: Adult Impact Questionnaire (AIQ)

NOTE: Please refer to the AIQ MOP to assist you during the survey.

INTRODUCTION: "In the first part of the interview, we collected data about your diet. Now, we will be asking questions about food and physical activity habits in your household, community, and other social support groups. This will include questions about your relatives and children that you know. We will also be doing some measurements at the end, such as height and weight. The interview will take about one hour. Let's get started!"

Interview date:	_____ / _____ / _____ MM DD YYYY
Interviewer name:	
Respondent name:	
Respondent address:	
Respondent phone number(s):	
Alternative contact name:	
Alternative contact address:	
Alternative contact phone number(s):	

Section1. Household Food Getting Frequency

READ: I will start by asking you about foods that you may have BROUGHT into your home for yourself and other household members. Think about foods you may have BOUGHT in stores, GOTTEN from a food bank or food assistance program, GOTTEN from hunting or fishing, GOTTEN as a gift from someone, or BROUGHT into the house as meals. For each food listed here, please tell me the number of times you **GOT** each food

in the last 30 DAYS. Do not include already prepared foods from vendors, delis, or restaurants. There are no right or wrong answers. **[Read question, then read food item and examples]**

QUESTION: In the last 30 days, how often did you get…	Number of times:
10. Fresh fruits	
11. Frozen fruits	
12. Canned fruits or fruit cups in 100% juice	
13. Canned fruits or fruit cups in light or heavy syrup	
14. Fresh vegetables or greens	
15. Frozen vegetables, not including potatoes like French fries or tater tots	
16. Canned vegetables	
17. Beans and peas, canned or dried, not including green beans	
18. Dried fruits and nuts, including trail mix	
19. 100% whole wheat breads or pastas	
20. Hot cereals, like Cream of Wheat, oatmeal, or atole	
21. Low-sugar, high-fiber cereals, like shredded wheat	
22. High-fiber rice, like brown rice, or wild rice	
23. Poultry, like chicken or turkey	
24. Game meat, like venison, elk, buffalo, or moose	
25. Fish or seafood	
26. Low-fat or low-sugar snacks, like baked chips, graham crackers, or low-sodium pretzels	
27. Low-fat deli meats, like low-fat bologna or turkey	
28. Cooking spray, like Pam	
29. Low-fat milks, like 1% or 2%, including Lactaid	
30. Skim (fat-free) milk, including Lactaid	
31. Other milk, like soy, rice, almond, or coconut	
32. Sugar-free drinks, like sparkling water	
33. Water, including plain, tap, or bottled	
34. 100% fruit juice	
35. Low-fat or light dressings, like Miracle Whip, light mayo	

Section 2: Household Patterns of Food and Physical Activity

READ: Now I will ask you about food and physical activity habits in your household **in the last 30 days**. After I read the activity, please tell me whether you did it "NEVER," "HARDLY EVER," "SOME OF THE TIME," or "MOST OF THE TIME." **[SHOW RESPONDENT FLASHCARD]** You can refer to this flashcard to help you answer. There are no right or wrong answers.

QUESTION: In the last 30 days, how often did… **[CHECK ONE ANSWER PER QUESTION]**
36. You use a shopping list or plan your meals in advance before you went shopping? ____ Never$_0$ ____ Hardly ever$_1$ ____ Some of the time$_2$ ____ Most of the time$_3$
37. People in your household eat a meal together, like dinner? ____ Never$_0$ ____ Hardly ever$_1$ ____ Some of the time$_2$ ____ Most of the time$_3$ ____ NA, lives alone$_4$
38. You or someone in your household bring home prepared foods from fast food restaurants, carry-out restaurants, delis, or other types of restaurants for the family? ____ Never$_0$ ____ Hardly ever$_1$ ____ Some of the time$_2$ ____ Most of the time$_3$
39. Your children or other household members help you prepare meals? ____ Never$_0$ ____ Hardly ever$_1$ ____ Some of the time$_2$ ____ Most of the time$_3$ ____ NA, lives alone$_4$
40. Some or all of your household members engage in a physical activity **together**, such as going for a walk? ____ Never$_0$ ____ Hardly ever$_1$ ____ Some of the time$_2$ ____ Most of the time$_3$ ____ NA, lives alone$_4$

41. You prepare a recipe from an online source, such as social media like Facebook or Instagram, but not including email? ____ Never$_0$ ____ Hardly ever$_1$ ____ Some of the time$_2$ ____ Most of the time$_3$
42. You engage in an exercise routine from an online source, such as social media like Facebook or Instagram, or an online workout video? ____ Never$_0$ ____ Hardly ever$_1$ ____ Some of the time$_2$ ____ Most of the time$_3$
43. You share your own health related goals, successes, or challenges with others on social media, like Facebook or Instagram? ____ Never$_0$ ____ Hardly ever$_1$ ____ Some of the time$_2$ ____ Most of the time$_3$

Section 3: Adult Food Preparation Methods

READ: Now I am going to ask you about how you have cooked different food items at home **in the last 30 days**. Please tell me your first and second cooking method of choice for each food item. For example, you can say your most common method of cooking a potato may be "deep fried" and your second method is "baked."

READ QUESTION: "In the last 30 days, how did you **most commonly** cook [FOOD TYPE] (Indicate with '1')?" **[Fill in a 1] Then read:** "What was your second most common way of cooking [SAME FOOD TYPE] (Indicate with '2')?" **[If the respondent only cooks the food using one method, put 1 and 2 in the same box]**

Probe: "Can you tell me how you did that? Did you add anything to the [food item]?" **[Fill in the Blank using respondent's own words about cooking methods.]**

In the last 30 days, how did you most commonly cook…														
	Deep fried	**Pan fried, without oil**	**Pan fried, with oil**	**Pan fried, drained & rinsed with hot water**	**Cooking spray**	**Broiled / baked**	**Grilled / or BBQ**	**Steamed**	**Boiled**	**Raw**	**Microwave**	**Other**	**Did not prepare in the last 30 days**
44. Chicken													
45. Pork (including bacon)													
46. Ground beef													
47. Vegetables													
48. Potatoes													
49. Fish													
50. Turkey													

Section 4: Change Agent Roles

READ: The following statements are about a child you may know: a grandchild, child, niece/nephew, or other child within your community, under age 18. We want to know how this child influences your health choices. Tell me if you think each statement is true for you "NEVER," "HARDLY EVER," "SOME OF THE TIME," or "MOST OF THE TIME". There are no right or wrong answers. **[Check ONE answer per statement]**

51. A child you know talks to you about the importance of food and physical activity habits. ____ Never$_0$ ____ Hardly ever$_1$ ____ Some of the time$_2$ ____ Most of the time$_3$
52. You talk with a child you know about the importance of healthy food and physica activity. ____ Never$_0$ ____ Hardly ever$_1$ ____ Some of the time$_2$ ____ Most of the time$_3$
53. A child you know convinces you to eat right and be physically active. ____ Never$_0$ ____ Hardly ever$_1$ ____ Some of the time$_2$ ____ Most of the time$_3$
54. A child you know helps you meet your food and physical activity goals. ____ Never$_0$ ____ Hardly ever$_1$ ____ Some of the time$_2$ ____ Most of the time$_3$
55. A child you know has the confidence to help you meet your food and physical act goals. ____ Never$_0$ ____ Hardly ever$_1$ ____ Some of the time$_2$ ____ Most of the time$_3$
56. You can maintain your food and physical activity habits without the help of a chi know. ____ Never$_0$ ____ Hardly ever$_1$ ____ Some of the time$_2$ ____ Most of the time$_3$

Section 5: Adult Knowledge

READ: Now I am going to ask you some questions about food and physical activity. Pick the answer you think is correct. **[Check ONE answer per question. Show flashcard for questions #55, #56, and #57. DO NOT read the "Don't know," option, use only as last resort]**

57. Which of the following foods is **lowest** in fat? ____ Cheetos$_1$ ____ Sun Chips$_2$ ____ Doritos$_3$ ____ Don't know$_{888}$
58. Which kind of bread has the **most** fiber? ____ Fry bread$_1$ ____ White bread$_2$ ____ 100% Whole wheat bread$_3$ ____ Don't know$_{888}$
59. Which of the following adds **the least amount** of fat when used for cooking? ____ Vegetable oil$_1$ ____ Shortening$_2$ ____ Cooking spray$_3$ ____ Don't know$_{888}$
60. Which of the following drinks has the **least** amount of sugar? ____ Fruit infused water$_1$ ____ Regular soda$_2$ ____ Gatorade$_3$ ____ Don't know$_{888}$
61. Which cereal has the **most** fiber? ____ Frosted flakes$_1$ ____ Corn flakes$_2$ ____ Shredded wheat$_3$ ____ Don't know$_{888}$
62. What is the **biggest** dietary risk factor for developing type 2 diabetes? ____ Having any sugar in your diet$_1$ ____ Eating too much and becoming overweight$_2$ ____ Not taking a multi-vitamin$_3$ ____ Don't know$_{888}$
63. What is the recommended amount of time that adults should spend doing physical activity each **week**? ____ 60 minutes$_1$ ____ 120 minutes$_2$ ____ 150 minutes$_3$ ____ Don't know$_{888}$

64. How many grams of sugar are in **<u>one serving</u>** of this food? **[Show FLASHCARD or picture on next page]**

____ 2 grams$_1$
____ 21 grams$_2$
____ 3 grams$_3$
____ Don't know$_{888}$

65. What is the serving size of the food item on this food label? **[Show FLASHCARD or picture on next page]**

____ 10 ounces$_1$
____ 28 ounces$_2$
____ 1 ounce$_3$
____ Don't know$_{888}$

66. What is the **<u>total</u>** fat content in this entire package? **[Show FLASHCARD or picture on next page]**

____ 30 grams$_1$
____ 3 grams$_2$
____ 10 grams$_3$
____ Don't know$_{888}$

Picture for questions #56, #57, and #58

Ingredients: Dehydrated Potatoes, Modified Food Starch, Corn Oil, Sugar, Salt, Soy Lecithin, Leavening (Monocalcium Phosphate and Sodium Bicarbonate), and Dextrose.
No Preservatives.

Nutrition Facts

Serving Size 1 oz. (28g/About 10 crisps)
Servings Per Container 10

Amount Per Serving	
Calories 120	Calories from Fat 30
	% Daily Value*
Total Fat 3g	**5%**
Saturated Fat 0g	**0%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 200mg	**8%**
Total Carbohydrate 21g	**7%**
Dietary Fiber 2g	**6%**
Sugars 2g	
Protein 2g	

Vitamin A 0%	•	Vitamin C 6%
Calcium 4%	•	Iron 0%
Thiamin 4%	•	Niacin 6%
Vitamin B6 4%	•	Phosphorus 8%
Zinc 2%		

* Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

Section 6: Adult Self-efficacy

READ: Now I am going to ask you about some activities. I'd like you to tell me how **DIFFICULT** or **EASY** it would be for **<u>you</u>** to do them in your everyday life **<u>at this time</u>**, given how much free time you have, what your family likes to eat, or what may be affordable. There are no right or wrong answers. If you are unsure, go with your best answer. Remember, I only want to know how difficult or easy these activities would be for you if you had to choose **<u>right now</u>**. **[Check DIFFICULT or EASY. If respondent states an action is very or somewhat difficult, check DIFFICULT. If respondent states an action is very or somewhat easy, check EASY.]**

QUESTION: Would it be difficult or easy for you to…	**Difficult$_0$**	**Easy$_1$**
67. Choose water instead of regular soda?		
68. Use cooking spray or vegetable oil instead of lard?		
69. Use food label information to make your food choices?		
70. Choose low-fat or fat-free milk instead of whole or 2% milk?		
71. Rinse ground meat in hot water after cooking and draining it?		
72. Eat smaller portion sizes instead of larger portion sizes?		
73. Steam, boil, or bake potatoes instead of deep-frying them?		
74. Buy 100% whole wheat bread instead of white bread?		
75. Eat more brown or wild rice instead of white rice?		
76. Order a salad instead of French fries at a fast food restaurant?		
77. Walk for 30 minutes most days of the week?		

Section 7: Adult intentions

READ: Next, I am going to ask you questions about some of your food and physical activity habits. If you were given only three choices, which one would you **<u>really</u>** choose? There are no right or wrong answers. **[Check ONE answer per statement. DO NOT read the "Refused," option, use only as last resort]**

78. If you had to buy milk, which would you buy? ____ Whole milk$_1$ ____ 2% milk$_2$ ____ Skim or 1% milk$_3$ ____ Refused$_{777}$
79. If you had to buy deli meats, which would you buy? ____ Bologna$_1$ ____ Ham$_2$ ____ Turkey$_3$ ____ Refused$_{777}$

80. For breakfast, which cereal would you choose? ____ Frost Flakes$_1$ ____ Shredded Wheat$_2$ ____ Cheerios$_3$ ____ Refused$_{777}$
81. If you were thirsty, which would you choose for a drink? ____ Regular soda$_1$ ____ 100% Juice$_2$ ____ Water$_3$ ____ Refused$_{777}$
82. The next time you want a snack, which would you choose? ____ Potato chips$_1$ ____ Cheez-its$_2$ ____ Pretzels$_3$ ____ Refused$_{777}$
83. The next time you buy bread, which would you choose? ____ White bread$_1$ ____ 100% Whole wheat bread$_2$ ____ Fry bread$_3$ ____ Refused$_{777}$
84. The next time you make a vegetable for dinner, which will you cook? ____ Corn$_1$ ____ Broccoli$_2$ ____ Potatoes$_3$ ____ Refused$_{777}$
85. The next time you go shopping, what will you do? ____ Make a shopping list$_1$ ____ Buy food on sale$_2$ ____ Get food that looks tasty$_3$ ____ Refused$_{777}$
86. The next time you have free time at home, what will you do? ____ Take a nap$_1$ ____ Go for a walk or do housework$_2$ ____ Watch TV or use the computer$_3$ ____ Refused$_{777}$

Section 8: Community Resources and Environment

READ: The following statements are about your access to healthy foods, exercise resources, and health resources. Please think about each statement and tell me whether you generally DISAGREE or AGREE with each statement. **[Check ONE answer per statement]**

QUESTION: Do you disagree or agree with the following statements:	**Disagree$_0$**	**Agree$_1$**
87. Making healthy food takes too much time.		

88. I would cook foods using healthier methods if I knew how.		
89. Fresh fruits and vegetables are not available where I shop.		
90. I would purchase healthy food more often if it were less expensive.		
91. Traditional foods are easy for me to get regularly.		
92. I often purchase groceries from convenience stores and gas station stores near the community.		
93. In general, it is difficult to get to a store to buy food.		
94. Physical activity facilities, like a gym, are not available to me.		
95. I feel confident exercising in my community.		
96. It is safe for me to exercise outside in my community.		
97. I use community facilities and services (like a community gym, fitness room, trainer) to exercise.		
98. I go to the nutritionist in the community for advice on how to eat healthier.		
99. I would like to have more exercise options available in my community.		
100. I would exercise more if there were more opportunities, like groups, for exercise.		
101. I would exercise if I had the time.		
102. I am satisfied with my current weight.		
103. If I lost some weight, I would be a healthier person.		
104. I attend community events (like Tribal Council meetings, health fairs) regularly		
105. I use social media (such as Facebook, Twitter, or Instagram) to learn about healthy eating and exercise.		
106. I am motivated to eat healthy foods and exercise when I see others posting about their success on social media.		

Section 9: International Physical Activity Questionnaire-Short Form (IPAQ-SF)

READ: I am going to ask you about the time you spent being physically active **in the last 7 days**. In other words, think about time you spent being physically active within the last week. **[Interviewer provide example: today is Wednesday, so I am asking about all the time you spent physically active since last Wednesday].**

I will ask you about different **types** of activity. The first is vigorous activity, which makes you breathe much harder than normal. When you are vigorously active, you are unable to

hold a conversation and may feel out of breath. Types of vigorous activity can include heavy lifting, digging, running, or shoveling snow. The second type is moderate activity, which makes you breathe somewhat harder than normal but you could probably still have a conversation. Types of moderate activity can include carrying light loads, yard work, house cleaning, or bicycling at a regular pace. Do you have any questions about the difference between the two? **[Allow time for questions]** Finally, I will ask about time spent walking and time spent sitting. Please answer each question even if you do not consider yourself to be an active person. Let's get started.

Think about the activities you do at work, at home, to get from place to place, and in your free time.

First, think about **vigorous** physical activities that you did **in the last 7 days**. Remember, these are activities that leave you out of breath and require a lot of effort, such as heavy lifting, shoveling snow, or running.

107. In the last **7 days**, on how many days did you do **vigorous** physical activi ____ Days per week ____ Don't know888 ____ Refused to answer777
108. How much time did you **usually** spend doing **vigorous** physical activities one of those days? ____ Hours per day, ____ minutes per day ____ Don't know888 ____ Refused to answer777

READ: Now think about **moderate** physical activities that you did **in the last 7 days**. Remember, theses are activities that make you breathe harder than normal but you could still hold a conversation, such as light lifting or yard work. Think about ONLY those activities that you did for at least 10 minutes at a time. Do **NOT** include walking.

109. In the last **7 days**, on how many days did you do **moderate** physical activ ____ Days per week ____ Don't know888 ____ Refused to answer777
110. How much time did you **usually** spend doing **moderate** physical activitie one of those days? ____ Hours per day, ____ minutes per day ____ Don't know888 ____ Refused to answer777

READ: Now think about the time you spent **walking in the last 7 days**. This includes at work and at home, walking to travel from place to place, and any other walking that you might do solely for recreation, sport, exercise, or leisure.

111. In the last **7 days**, on how many days did you **walk** for **at least 10 minute** time?

____ Days per week
____ Don't know$_{888}$
____ Refused to answer$_{777}$

112. How much time did you **usually** spend **walking** on one of those days?

____ Hours per day, ____ minutes per day
____ Don't know$_{888}$
____ Refused to answer$_{777}$

113. In the last **7 days**, was your level of physical activity less than usual, usua more than usual?

____ Less than usual$_1$ → If less than usual, go to question #103, otherwise, SKIP TO QUESTION #104
____ Usual$_2$
____ More than usual$_3$

114. If your level of physical activity was less than usual, what was the reason?

____ An existing health condition$_1$
____ Change in schedule$_2$
____ Other reason$_3$ → Please specify:

_____

115. Do you use a pedometer?

____ Yes$_1$ → If yes, go to question #105 and #106, otherwise, SKIP TO QUESTION #1
____ No$_0$

116. How many steps did you take yesterday? _____ steps

117. How many steps did you take in the last week? _____ steps

Section 10: Sociodemographics

READ: The following section is a list of questions to learn about you and your household. Please answer these questions to your best ability. All information will be kept confidential. This information will help to develop programs that will best fit the people in your community. **[See specific directions for each question]**

118. Age (in years): ____ Years
119. Sex: ____Male$_0$ ____Female$_1$
120. Are you the main food preparer in your household? ____Yes$_1$ ____ No$_0$
121. Are you the main food shopper in your household? ____Yes$_1$ ____ No$_0$
122. How many people live in your household? ____ Number of people in household
123. How many children (under age 18 years old) live in your household? **[If none, skip to question #115]** ____ Number of children in household
124. How many children in your household attend school between grades 2 through 6 this year? ____ Number of children in grades 2 through 6
125. Which school does each child attend? **[Only include children in grades 2 through 6]** School 1: _____ _____ School 2: _____ _____ School 3: _____ _____ School 4: _____ _____

126. What is your current employment status? **[Check ONE answer]**

____ Employed full-time (40+ hrs/wk)$_1$
____ Employed part-time (<40 hrs/wk)$_2$
____ Seasonally/temporary employed$_3$
____ Unemployed/not employed$_4$
____ Student$_5$
____ Self-employed$_6$
____ Retired$_7$
____ Disabled$_8$
____ Refused$_{777}$

127. Including yourself, how many adults in your household work? **[If none, skip to question #118]**

____ Number of working adults

128. Where does each adult in your household work (such as Tribal Government, casino, etc.)?

Worksite 1:
_____
_____

Worksite 2:
_____
_____

Worksite 3:
_____
_____

Worksite 4:
_____
_____

129. What is your current marital status? **[Check ONE answer]**

____ Single/never married$_1$
____ Married$_2$
____ Separated$_3$
____ Divorced$_4$
____ Widowed$_5$
____ Common law$_6$
____ Lives with partner$_7$
____ Refused$_{777}$

130. What is the highest education level you have completed?

____ None$_0$
____ Elementary school$_1$
____ Middle school$_2$
____ Some high school$_3$
____ High school diploma$_4$
____ GED$_5$
____ Associate's degree$_6$
____ Technical school/vocational school$_7$
____ Some college$_8$
____ Bachelor's degree$_9$
____ Master's degree$_{10}$
____ Doctoral degree$_{11}$
____ Other$_{12}$_____
____ Refused$_{777}$

131. Do you currently smoke commercial tobacco (bought from the store)?

____ Yes$_1$
____ No$_0$
____ Refused$_{777}$

132. How many of the following items **in working condition** do you have in your home? **[Enter a number for each item. If none, enter 0. Do not leave any items blank.]**

____ TV$_1$
____ VCR/DVD player$_2$
____ Home computer/laptop/tablet$_3$
____ CD/MP3/iPod$_4$
____ Satellite dish/cable$_5$
____ Landline telephone$_6$
____ Cell phone$_7$
____ Video game console$_8$
____ Microwave$_9$
____ Oven$_{10}$
____ Toaster oven$_{11}$
____ Sewing machine$_{12}$
____ Refrigerator$_{13}$
____ Washer$_{14}$
____ Dryer$_{15}$
____ Exercise machine$_{16}$
____ Bicycle$_{17}$
____ Automobile$_{18}$
____ Motorcycle/4-wheeler/ATV$_{19}$
____ Refused$_{777}$

133. Does your home have working electricity or a generator?

____ Yes$_1$
____ No$_0$

134. Do you have Internet service in working condition in your home? ____ Yes1 ____ No0
135. Do you use social media, like Facebook, Instagram, or Twitter? ____ Yes1 ____ No0
136. Is there a facility in your community for you to go to be physically active? ____ Yes1 ____ No0

Section 11: Family and Personal Medical History

READ: In this section, I will ask you about your personal and family medical history. These are yes or no answers, I do not need to know any names. **[Check ONE answer per condition]**

QUESTION: Has a doctor or nurse ever told…	
137. a. YOU that you are overweight or obese? ____ Yes1 ____ No0 ____ Don't know888	138. b. A BLOOD RELATIVE that they are overweight or obese? ____ Yes1 ____ No0 ____ Don't know888
139. a. YOU that you have heart disease? ____ Yes1 ____ No0 ____ Don't know888	140. b. A BLOOD RELATIVE that they have heart disease? ____ Yes1 ____ No0 ____ Don't know888
141. a. YOU that you have high blood pressure/hypertension? ____ Yes1 ____ No0 ____ Don't know888	142. b. A BLOOD RELATIVE that they have high blood pressure/hypertension? ____ Yes1 ____ No0 ____ Don't know888
143. a. YOU that you have type 1 diabetes? ____ Yes1 ____ No0 ____ Don't know888	144. b. A BLOOD RELATIVE that they have type 1 diabetes? ____ Yes1 ____ No0 ____ Don't know888
145. a. YOU that you have type 2 diabetes? ____ Yes1 ____ No0 ____ Don't know888	146. b. A BLOOD RELATIVE that they have type 2 diabetes? ____ Yes1 ____ No0 ____ Don't know888

147. a. YOU that you have gestational diabetes? ____ Yes$_1$ ____ No$_0$ ____ Don't know$_{888}$	148. b. A BLOOD RELATIVE that they have gestational diabetes? ____ Yes$_1$ ____ No$_0$ ____ Don't know$_{888}$
149. a. YOU that you have cancer? ____ Yes$_1$ ____ No$_0$ ____ Don't know$_{888}$	150. b. A BLOOD RELATIVE that they have cancer? ____ Yes$_1$ ____ No$_0$ ____ Don't know$_{888}$

Section 12: Food Assistance

READ: I am now going to ask you about food assistance programs. Please respond with a YES or NO. **[Check YES or NO. If "other," please ask to specify and fill in the blank.]**

QUESTION: Do YOU or a HOUSEHOLD MEMBER receive any of the following t of food assistance?
151. WIC (Women, Infants, and Children) ____ Yes1 ____ No0
152. SNAP (Supplemental Nutrition Assistance Program, formerly known as f stamps) ____ Yes1 ____ No0
153. Commodity foods, like FDPIR (Food Distribution Program on Indian Reservations) ____ Yes1 ____ No0
154. Food Bank ____ Yes1 ____ No0
155. Senior Center meals ____ Yes1 ____ No0
156. Church ____ Yes1 ____ No0
157. Other tribal food distribution programs ____ Yes1 ____ No0
158. Local farm surplus ____ Yes1 ____ No0
159. Summer Food Service Program (lunch meals for children) ____ Yes1 ____ No0
160. Other, please specify: _____ _____

Section 13: Anthropometry

READ: Ok, now we're going to do a few measurements, including blood pressure, heart rate, height, weight, percent body fat, and waist/hip circumference All measurements are non-invasive, and we will write down your measurements for you to take home when we are done. We're going to do each measurement at least twice, so it will take a little while, but this is the last section!

	MEASUREMENT	**SELF-REPORTED**
161. Blood pressure and resting heart rate Record BP as <u>systolic</u> / <u>diastolic</u> mmHg	BP 1: _____ . ___ / _____ . ___ mmHg HR 1: _____ bpm BP 2: _____ . ___ / _____ . ___ mmHg HR 2: _____ bpm	NA
162. Measured height (nearest 1/8 inch) Take a third measurement **ONLY** if the first and second measurements are different by **more than 0.5 inches**	Height 1: _____ft. _____in. _____/8 in. Height 2: _____ft. _____in. _____/8 in. Height 3: _____ft. _____in. _____/8 in.	Height: _____ft. _____in.

READ: Do you have a pacemaker?

____ Yes → If yes, **DO NOT measure % BF in question #145 or #146**

____ No

	MEASUREMENT	**SELF-REPORTED**
163. Measured weight AND % body fat Take a third measurement **ONLY** if the first and second measurements are different by **more than 2 pounds**	Weight 1: _____ . __lbs; % BF 1: _____ . __% Weight 2: _____ . __lbs; % BF 2: _____ . __% Weight 3: _____ . __lbs; % BF 3: _____ . __%	Weight: _____lbs
164. Handheld % body fat	% BF 1: _____ . ____%	NA

	% BF 2: _____ . ____%	
165. Measured waist circumference Take a third measurement **ONLY** if the first and second measurements are different by **more than 3 centimeters**	Measurement 1: _____ . ____cm. Measurement 2: _____ . ____cm. Measurement 3: _____ . ____cm.	NA
166. Measured hip circumference Take a third measurement **ONLY** if the first and second measurements are different by **more than 3 centimeters**	Measurement 1: _____ . ____cm. Measurement 2: _____ . ____cm. Measurement 3: _____ . ____cm.	NA

READ: Thank you, we are very grateful for your participation in this survey!

INTERVIEWER ASSESSMENT:

167. What is the quality of the interview? ____ Good$_1$ ____ Fair$_2$ ____ Poor$_3$ ____ Not useable$_4$

Comments (if interview was fair, poor, or not useable, please explain why):

_____
_____
_____
_____
_____

I have checked this questionnaire for completeness and verify that it is correct.

Interviewer signature:

Date: _____ / _____ / _____
MM DD YYYY

Chapter 9. References

Abasta, R. (2014). *President Shelly signs Healthy Dine ' Nation Act of 2014 into law*. Window Rock, Navajo Nation.

Adams, A. K., Larowe, T. L., Cronin, K. a., Prince, R. J., Wubben, D. P., Parker, T., & Jobe, J. B. (2012). The healthy children, strong families intervention: Design and community participation. *Journal of Primary Prevention*, *33*(4), 175–185. http://doi.org/10.1007/s10935-012-0275-y

Adams, M. A., Ding, D., Sallis, J. F., Bowles, H. R., Ainsworth, B. E., Bergman, P., … Matsudo, S. (2013). Patterns of neighborhood environment attributes related to physical activity across 11 countries : a latent class analysis. *International Journal of Behavioral Nutrition and Physical Activity*, *10*(34).

Adams, M. A., Sallis, J. F., Kerr, J., Conway, T. L., Saelens, B. E., Frank, L. D., … Cain, K. L. (2011). Neighborhood environment pro fi les related to physical activity and weight status : A latent pro fi le analysis. *Preventive Medicine*, *52*(5), 326–331. http://doi.org/10.1016/j.ypmed.2011.02.020

Adams, M. A., Todd, M., Kurka, J., Conway, T. L., Cain, K. L., Frank, L. D., & Sallis, J. F. (2015). Patterns of Walkability, Transit, and Recreation Environment for Physical Activity. *American Journal of Preventive Medicine*, *49*(6), 878–887.

Allison, D. B., Downey, M., Atkinson, R. L., Billington, C. J., Bray, G. a, Eckel, R. H., … Tremblay, A. (2008). Obesity as a disease: a white paper on evidence and arguments commissioned by the Council of the Obesity Society. *Obesity (Silver Spring, Md.)*, *16*(6), 1161–1177. http://doi.org/10.1038/oby.2008.231

Ballew, C., White, L. L., Strauss, K. F., Benson, L. J., Mendlein, J. M., & Mokdad, A. H.

(1997). Intake of nutrients and food sources of nutrients among the Navajo: findings from the Navajo Health and Nutrition Survey. *The Journal of Nutrition*, *127*(10 Suppl), 2085S–2093S. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/9339174

Bandura, A. (2001). Social Cognitive Theory: An Agentic Perspective, *52*, 1–26.

Bandura, A. (2002). Social Cognitive Theory in Cultural Context. *Applied Psychology*, *51*(2), 269–290. http://doi.org/10.1111/1464-0597.00092

Bandura, A. (2004). Health promotion by social cognitive means. *Health Education & Behavior : The Official Publication of the Society for Public Health Education*, *31*(2), 143–64. http://doi.org/10.1177/1090198104263660

Belone, L., Lucero, J., Duran, B., Tafoya, G., Baker, E., Chan, D., … Wallerstein, N. (2016). Community-Based Participatory Research Conceptual Model: Community Partner Consultation and Face Validity. *Qualitative Health Research*, *26*(1), 117–135.

Bentley, M. E., Johnson, S. L., Wasser, H., Creed-kanashiro, H., Shroff, M., Rao, S. F., & Cunningham, M. (2014). Formative research methods for designing culturally appropriate , integrated child nutrition and development interventions : an overview, *1308*, 54–67. http://doi.org/10.1111/nyas.12290

Berg, C. J., Daley, C. M., Nazir, N., Kinlacheeny, J. B., Ashley, A., Ahluwalia, J. S., … Choi, W. S. (2012). Physical activity and fruit and vegetable intake among American Indians. *Journal of Community Health*, *37*(1), 65–71. http://doi.org/10.1007/s10900-011-9417-z

Blue, V., Jernigan, B., Boe, G., Noonan, C., Carroll, L., & Buchwald, D. (2016).

Assessing Feasibility and Readiness to Address Obesity through Policy in American Indian Reservations. *Journal of Health Disparities Research and Practice*, *9*(3), 168–180.

Brisbois, T. D., Farmer, A. P., & Mccargar, L. J. (2012). Obesity Diagnostic and Prevention Early markers of adult obesity : a review, (April), 347–367. http://doi.org/10.1111/j.1467-789X.2011.00965.x

Browning, M. G., Franco, R. L., Cyrus, J. C., Celi, F., & Evans, R. K. (2016). Changes in Resting Energy Expenditure in Relation to Body Weight and Composition Following Gastric Restriction: A Systematic Review. *Obesity Surgery*, *26*(7), 1607–1615. http://doi.org/10.1007/s11695-016-2184-2

Bullock, A., Sheff, K., Moore, K., & Manson, S. (2017). Obesity and overweight in American indian and Alaska native children, 2006-2015. *American Journal of Public Health*, *107*(9), 1502–1507. http://doi.org/10.2105/AJPH.2017.303904

Byker Shanks, C., Smith, T., Ahmed, S., & Hunts, H. (2016). Assessing foods offered in the Food Distribution Program on Indian Reservations (FDPIR) using the Healthy Eating Index 2010. *Public Health Nutrition*, *19*(7), 1315–1326. http://doi.org/10.1017/S1368980015002359

Center for Livable Future. (n.d.). Food Policy Networks. Retrieved July 20, 2017, from http://www.foodpolicynetworks.org/

Center for Livable Future. (2015). *Food Policy Council Achievements*. Baltimore, MD. Retrieved from http://www.foodpolicynetworks.org/_pdf/directory/FPC Achievements-final-1.pdf

Charmaz, C. (2006). *Constructing Grounded Theory: A Practical Guide Through*

Qualitative Analysis. London: Sage.

Chino, M., Haff, D., & Dodge Francis, C. (2009). Patterns of Commodity Food Use among American Indians. *Pimatisiwin: A Journal of Aboriginal and Indigenous Community Health*, *7*(2), 279–290.

Chowkwanyun, M. (2011). the Strange Disappearance of History From Racial Health Disparities Research. *Du Bois Review*, *8*(1), 253–270. http://doi.org/http://dx.doi.org/10.1017/S1742058X11000142

Churchill, W. (2004). *Kill the Indian, Save the Man*. San Francisco: City Lights Books.

Clark, L. (2015, March 25). The Navajo Nation Will Soon Have the Country's First-Ever Junk-Food Tax. *Mother Jones*. Retrieved from http://www.motherjones.com/environment/2015/03/navajo-nation-junk-food-tax

Cobb, L. K., Appel, L. J., & Franco, M. (2015). The relationship of the local food environment with obesity: A systematic review of methods, study quality and results. *Obesity*, *23*(7), 1331–1344. http://doi.org/10.1002/oby.21118.The

Cockerham, W. (2007). Medical Sociology and Sociological Theory. In W. Cockerham (Ed.), *The Blackwell Companion to Medical Sociology*. Oxford, UK: Blackwell Publishers Ltd.

Cohen, D. A., Scribner, R. A., & Farley, T. A. (2000). A Structural Model of Health Behavior : A Pragmatic Approach to Explain and Influence Health Behaviors at the Population Level, *154*, 146–154. http://doi.org/10.1006/pmed.1999.0609

Communities, A. I., Adams, A. K., Scott, J. R., Prince, R., & Williamson, A. (2014). Using Community Advisory Boards to Reduce Environmental Barriers to Health in, 1–11.

Compher, C. (2006a). The nutrition transition in American Indians. *Journal of Transcultural Nursing : Official Journal of the Transcultural Nursing Society / Transcultural Nursing Society*, *17*(3), 217–23. http://doi.org/10.1177/1043659606288376

Compher, C. (2006b). The nutrition transition in American Indians. *Journal of Transcultural Nursing : Official Journal of the Transcultural Nursing Society / Transcultural Nursing Society*, *17*(3), 217–223. http://doi.org/10.1177/1043659606288376

Compher, C. (2006c). The nutrition transition in American Indians. *Journal of Transcultural Nursing : Official Journal of the Transcultural Nursing Society / Transcultural Nursing Society*, *17*(3), 217–23. http://doi.org/10.1177/1043659606288376

Dedoose. (2016). Los Angeles, CA: SocioCultural Research Consultants, LLC. Retrieved from www.dedoose.com

Denham, A. R. (2008). Rethinking historical trauma: narratives of resilience. *Transcultural Psychiatry*, *45*(3), 391–414. http://doi.org/10.1177/1363461508094673

Drewnowski, A. (2004). Obesity and the food environment: Dietary energy density and diet costs. *American Journal of Preventive Medicine*, *27*(3 SUPPL.), 154–162. http://doi.org/10.1016/j.amepre.2004.06.011

Duran, E. (2006). *Healing the Soul Wound: counselling with American Indians and other Native Peoples*. (A. E. Ivey & D. W. Sue, Eds.). New York: Teachers College Press.

Ewart-Pierce, E., Mejía Ruiz, M. J., & Gittelsohn, J. (2016). “Whole-of-Community”

Obesity Prevention: A Review of Challenges and Opportunities in Multilevel, Multicomponent Interventions. *Current Obesity Reports*, *5*(3), 361–374. http://doi.org/10.1007/s13679-016-0226-7

Ezzati, M., & Riboli, E. (2012). Can Noncommunicable Diseases Be Prevented? Lessons from Studies of Populations and Individuals. *Science*, (337), 1482–7.

First Nations Development Institute. (2016). Indian Country Food Price Index: Exploring Variation in Food Pricing Across Native Communities. Retrieved from http://www.firstnations.org/system/files/Indian_Country_Food_Price_Index_6-30-2016_FINAL FIXED.pdf

Flegal, K. M., Carroll, M. D., Ogden, C. L., & Curtin, L. R. (2014). CLINICIAN ' S CORNER Among US Adults , 1999-2008, *303*(3), 235–241.

Fleischhacker, S., Byrd, R. R., Ramachandran, G., Vu, M., Ries, A., Bell, R. A., & Evenson, K. R. (2012a). Tools for healthy tribes: improving access to healthy foods in Indian country. *American Journal of Preventive Medicine*, *43*(3 Suppl 2), S123-9. http://doi.org/10.1016/j.amepre.2012.05.015

Fleischhacker, S., Byrd, R. R., Ramachandran, G., Vu, M., Ries, A., Bell, R. A., & Evenson, K. R. (2012b). Tools for Healthy Tribes. *American Journal of Preventive Medicine*, *43*(3), S123–S129. http://doi.org/10.1016/j.amepre.2012.05.015

Fleischhacker, S., Vu, M., Ries, A., & McPhail, A. (n.d.). Engaging tribal leaders in an American Indian healthy eating project through modified talking circles. *Family & Community Health*, *34*(3), 202–10. http://doi.org/10.1097/FCH.0b013e31821960bb

Fleischhacker, S., Vu, M., Ries, A., & McPhail, A. (2011). Engaging tribal leaders in an American Indian healthy eating project through modified talking circles. *Family &*

Community Health, *34*(3), 202–210. http://doi.org/10.1097/FCH.0b013e31821960bb

Fothergill, E., Guo, J., Howard, L., Kerns, J. C., Knuth, N. D., Chen, K. Y., … Kevin, D. (2016). Persistent metabolic adaptation 6 years after The Biggest Loser competition. *Obesity (Silver Spring)*, *24*(8), 1612–1619. http://doi.org/10.1002/oby.21538.Persistent

Foucault, M. (2006). *Psychiatric Power: Lectures at the College de France 1973-1974*. (J. Lagrange, Ed.). New York, NY: Palgrave Macmillan.

Frieden, T. R. (2010). A Framework for Public Health Action : The Health Impact Pyramid. *American Journal of Public Health*, *100*(4), 590–595. http://doi.org/10.2105/AJPH.2009.185652

Galtung, J. (1969). Violence, peace, and peace research. *Journal of Peace Research*, *6*(3), 167–191.

Gittelsohn, J., Davis, S. M., Steckler, A., Ethelbah, B., Clay, T., Metcalfe, L., & Rock, B. H. (2003). Pathways: lessons learned and future directions for school-based interventions among American Indians. *Preventive Medicine*, *37*(6 Pt 2), S107-12. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/14636815

Gittelsohn, J., Evans, M., Story, M., Davis, S. M., Metcalfe, L., Helitzer, D. L., & Clay, T. E. (1999). Multisite formative assessment for the pathways study to prevent obesity in American Indian schoolchildren. *American Journal of Clinical Nutrition*, *69*(4 SUPPL.).

Gittelsohn, J., Jock, B., Redmond, L., Fleischhacker, S., Eckmann, T., Bleich, S. N., … Caballero, B. (2017a). OPREVENT2: Design of a multi-institutional intervention for obesity control and prevention for American Indian adults. *BMC Public Health*,

17(1), 105. http://doi.org/10.1186/s12889-017-4018-0

Gittelsohn, J., Jock, B., Redmond, L., Fleischhacker, S., Eckmann, T., Bleich, S. N., … Caballero, B. (2017b). OPREVENT2: Design of a multi-institutional intervention for obesity control and prevention for American Indian adults. *BMC Public Health*, *17*(1).

Gittelsohn, J., Roache, C., Kratzmann, M., Ogina, J., & Sharma, S. (2010). Participatory Research for Chronic Disease Prevention in Inuit Communities. *American Journal of Health Behavior*, *34*(4), 453–464. Retrieved from http://www.ebscohost.com

Gittelsohn, J., & Rowan, M. (2011). Preventing diabetes and obesity in American Indian communities: The potential of environmental interventions. *American Journal of Clinical Nutrition*, *93*(5), 1179S–83S. http://doi.org/10.3945/ajcn.110.003509

Gittelsohn, J., Rowan, M., & Gadhoke, P. (2012). Interventions in small food stores to change the food environment, improve diet, and reduce risk of chronic disease. *Preventing Chronic Disease*, *9*, E59. Retrieved from http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3359101&tool=pmcentrez&rendertype=abstract

Gittelsohn, J., & Sharma, S. (2009). Physical, Consumer, and Social Aspects of Measuring the Food Environment Among Diverse Low-Income Populations. *American Journal of Preventive Medicine*, *36*(4), S161–S165. http://doi.org/10.1016/j.amepre.2009.01.007

Gittelsohn, J., Steckler, A., Johnson, C. C., Pratt, C., Grieser, M., Pickrel, J., … Staten, L. K. (2006). Formative research in school and community-based health programs and studies: "state of the art" and the TAAG approach. *Health Education & Behavior :*

The Official Publication of the Society for Public Health Education, *33*(1), 25–39. http://doi.org/10.1177/1090198105282412

Gortmaker, S. L., Swinburn, B. A., Levy, D., Carter, R., Mabry, P. L., Finegood, D. T., … Moodie, M. L. (2011). Changing the future of obesity: science, policy, and action. *Lancet*, *378*(9793), 838–47. http://doi.org/10.1016/S0140-6736(11)60815-5

Health, C. on S. D. of. (2008). *Closing the gap in a generation*. Geneva.

Heron, M. (2016). National Vital Statistics Reports Deaths: leading causes for 2014. *National Vital Statistics Reports : From the Centers for Disease Control and Prevention, National Center for Health Statistics, National Vital Statistics System*, *56*(5), 1–95. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/18092547

Howard, B. V, Lee, E. T., Cowan, L. D., Devereux, R. B., Galloway, J. M., Go, O. T., … Welty, T. K. (2015). Rising Tide of Cardiovascular Disease in American Indians.

Howard, B. V, Lee, E. T., Cowan, L. D., Fabsitz, R. R., Howard, W. J., Oopik, a J., … Welty, T. K. (1995). Coronary heart disease prevalence and its relation to risk factors in American Indians. The Strong Heart Study. *American Journal of Epidemiology*, *142*(3), 254–268.

Hutchinson, R. N., & Shin, S. (2014). Systematic review of health disparities for cardiovascular diseases and associated factors among American Indian and Alaska native populations. *PLoS ONE*, *9*(1). http://doi.org/10.1371/journal.pone.0080973

Indian Health Service. (n.d.). Healthy Weight For Life - Trends and Impact. Retrieved from http://www.ihs.gov/healthyweight/trends/

Indian Health Service. (2008). Indian Health Disparities, 1–2. Retrieved from http://www.ihs.gov/newsroom/factsheets/disparities/

Indian Health Service. (2011). *A Vision for Healthy Weight Across the Lifespan of American Indians and Alaska Natives*. Rockville, MD.

Indian Health Service. (2014). Trends in Indian Health: 2014 Edition. Retrieved from https://www.ihs.gov/dps/includes/themes/newihstheme/display_objects/documents/Trends2014Book508.pdf

Israel, B. a, Eng, E., Schulz, A. J., & Parker, E. A. (Eds.). (2013). *Methods for Community-Based Participatory Research for Health* (Second Edi). San Francisco: Jossey-Bass.

Janz, N., Champion, V., & Strecher, V. (2002). *Health Behavior and Health Education: Theory, Research, and Practice*. (K. Glanz, B. Rimer, & F. Lewis, Eds.) (3rd ed). San Francisco: Jossey-Bass.

Kalt, J. P., & Singer, J. W. (2004). Myths And Realities of Tribal Sovereignty : The Law And Economics of Indian Self-Rule. *KSG Working Paper No. RWP04-16*, (March). Retrieved from http://dx.doi.org/10.2139/ssrn.529084

Kaufman, P., Dicken, C., & Williams, R. (2014a). Measuring Access to Healthful , Affordable Food in American Indian and Alaska Native Tribal Areas.

Kaufman, P., Dicken, C., & Williams, R. (2014b). Measuring Access to Healthful , Affordable Food in American Indian and Alaska Native Tribal Areas, (131).

Kingdon, J. (2003). *Agendas, Alternatives and Public Policies* (2nd ed). New York, NY: Longman.

Knowler, W. C., Pettitt, D. J., Savage, P. J., & Bennett, P. H. (1981). Diabetes incidence in Pima indians: contributions of obesity and parental diabetes. *American Journal of Epidemiology*, *113*(2), 144–156.

Knuth, N. D., Johannsen, D. L., Tamboli, R. A., Marks-, P. A., Huizenga, R., Chen, K. Y., … Hall, D. (2015). NIH Public Access, *22*(12), 2563–2569. http://doi.org/10.1002/oby.20900.Metabolic

Kuhnlein, H. V, & Receveur, O. (1996). Dietary Change and Traditional Food Systems of Indigenous.

Landry, A. (2014). Navajo Nation Council Approves Junk Food Tax to Fight Obesity. Retrieved from http://indiancountrytodaymedianetwork.com/2014/02/01/navajo-nation-council-approves-junk-food-tax-fight-obesity-153376

Llewellyn, A., Simmonds, M., Owen, C. G., & Woolacott, N. (2015). Pediatric Obesity / Adult Etiology Childhood obesity as a predictor of morbidity in adulthood : a systematic review and meta-analysis, 1–12. http://doi.org/10.1111/obr.12316

Makosky Daley, C., James, A. S., Ulrey, E., Joseph, S., Talawyma, A., Choi, W. S., … Coe, M. K. (2010). Using focus groups in community-based participatory research: challenges and resolutions. *Qualitative Health Research*, *20*(5), 697–706. http://doi.org/10.1177/1049732310361468

Mayer-Davis, E. J., Lawrence, J. M., Dabelea, D., Divers, J., Isom, S., Dolan, L., … Wagenknecht, L. (2017). Incidence Trends of Type 1 and Type 2 Diabetes among Youths, 2002–2012. *New England Journal of Medicine*, *376*(15), 1419–1429. http://doi.org/10.1056/NEJMoa1610187

McCutcheon. (1987). *Latent class analysis* (Sage Unive). Newbury Park, CA: Sage.

McFarland, B. H., Gabriel, R. M., Bigelow, D. a, & Walker, R. D. (2006). Organization and financing of alcohol and substance abuse programs for American Indians and Alaska Natives. *American Journal of Public Health*, *96*(8), 1469–77.

http://doi.org/10.2105/AJPH.2004.050575

McLeroy, K. R., Bibeau, D., Steckler, a, & Glanz, K. (1988). An ecological perspective on health promotion programs. *Health Education Quarterly*, *15*(4), 351–77. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/3068205

Meyer, K. A., Boone-heinonen, J., Duffey, K. J., Rodriguez, D. A., Kiefe, C. I., Lewis, C. E., & Gordon-larsen, P. (2015). Health & Place Combined measure of neighborhood food and physical activity environments and weight-related outcomes : The CARDIA study, *33*, 9–18.

Mikkelsen, B. E., Novotny, R., & Gittelsohn, J. (2016). Multi-level, multi-component approaches to community based interventions for healthy living—a three case comparison. *International Journal of Environmental Research and Public Health*, *13*(10), 1–18. http://doi.org/10.3390/ijerph13101023

Minkler, M., & Wallerstein, N. (2008). *Community-Based Participatory Research for Health: From Process to Outcomes* (Second edi). San Francisco: Jossey-Bass.

Mitchell, F. M. (2012). Reframing diabetes in American Indian communities: A social determinants of health perspective. *Health & Social Work*, *37*(2), 71–79. http://doi.org/10.1093/hws/hls013

Muthén, L. K., & Muthén, B. O. (n.d.). Mplus user's guide (7th ed.). Los Angeles: Muthén & Muthén.

Naqshbandi, M., Harris, S. B., Esler, J. G., & Antwi-nsiah, F. (2008). Global complication rates of type 2 diabetes in Indigenous peoples : A comprehensive review. *Diabetes Research and Clinical Practice*, *82*, 1–17. http://doi.org/10.1016/j.diabres.2008.07.017

National Congress of American Indians. (2015). *Tribal Nations of the United States: An Introduction*. Washington, D.C. Retrieved from http://www.ncai.org/tribalnations/introduction/Tribal_Nations_and_the_United_States_An_Introduction-web-.pdf

Nylund, K. L., Asparouhov, T., Muthén, B. O., Nylund, K. L., Asparouhov, T., Muthén, B. O., & Nylund, K. L. (2007). Deciding on the Number of Classes in Latent Class Analysis and Growth Mixture Modeling : A Monte Carlo Simulation Study Deciding on the Number of Classes in Latent Class Analysis and Growth Mixture Modeling : A Monte Carlo Simulation Study. *Structural Equation Modeling*, *14*(4), 535–569. http://doi.org/10.1080/10705510701575396

O'Connell, J. M., Wilson, C., Manson, S. M., & Acton, K. J. (2012). The costs of treating American Indian adults with diabetes within the Indian health service. *American Journal of Public Health*, *102*(2), 301–308. http://doi.org/10.2105/AJPH.2011.300332

Ogden, C. L., Carroll, M. D., Kit, B. K., & Flegal, K. M. (2014). Prevalence of childhood and adult obesity in the United States, 2011-2012. *JAMA : The Journal of the American Medical Association*, *311*(8), 806–14. http://doi.org/10.1001/jama.2014.732

Perry, C., & Hoffman, B. (2010). Assessing tribal youth physical activity and programming using a community-based participatory research approach. *Public Health Nursing*, *27*(2), 104–114. http://doi.org/10.1111/j.1525-1446.2010.00833.x

Pluye, P., Potvin, L., & Denis, J. (2004). Making public health programs last : conceptualizing sustainability. http://doi.org/10.1016/j.evalprogplan.2004.01.001

Pomeranz, J. L. (2014). Sugary beverage tax policy: Lessons learned from tobacco. *American Journal of Public Health*, *104*(3), 13–15. http://doi.org/10.2105/AJPH.2013.301800

Popkin, B. M. (2002). An overview on the nutrition transition and its health implications: the Bellagio meeting. *Public Health Nutrition*, *5*(1A), 93–103. http://doi.org/10.1079/PHN2001280

Popkin, B. M. (2006). Global nutrition dynamics : the world is shifting rapidly toward a diet.

Redmond, L. (2017). *Obesity Prevention Among American Indian Adults: Impact Evaluation of a Multi-level, Multi-component Intervention*. Johns Hopkins University.

Reilly, J. J., & Kelly, J. (2011). Long-term impact of overweight and obesity in childhood and adolescence on morbidity and premature mortality in adulthood : systematic review. *Pediatric Review*, *35*, 891–898. http://doi.org/10.1038/ijo.2010.222

Roanhorse, O. (2017). Physical activity in Indian country. *Preventive Medicine*, *95*, S151–S153. http://doi.org/10.1016/j.ypmed.2016.12.031

Rose, G. (2001). Sick individuals and sick populations. *International Journal of Epidemiology*, *30*, 427–432.

Sabatier, P. A., & Sabatier, P. A. (2016). The advocacy coalition framework : revisions and relevance for Europe The advocacy coalition framework : revisions and relevance for Europe, *1763*(April), 37–41. http://doi.org/10.1080/13501768880000051

Scheirer, M. A., & Dearing, J. W. (2011). An Agenda for Research on the Sustainability

of Public Health Programs, *101*(11), 2059–2067. http://doi.org/10.2105/AJPH.2011.300193

Schell, L. M., Burnitz, K. K., & Lathrop, P. W. (2010). Pollution and human biology. *Annals of Human Biology*, *37*(June), 347–366. http://doi.org/10.3109/03014461003705511

Schell, S. F., Luke, D. A., Schooley, M. W., Elliott, M. B., Herbers, S. H., Mueller, N. B., & Bunger, A. C. (2013). Public health program capacity for sustainability : a new framework, 1–9.

Schulz, L. O. (2016). High-Risk Populations: The Pima of Arizona and Mexico. *Curr Obes Rep*, *4*(1), 92–98. http://doi.org/10.1007/s13679-014-0132-9.High-Risk

Segal, L. M., Rayburn, J., & Martin, A. (2017). *The State of Obesity: 2017*. Washington, D.C.

Sharma, A., Grummer-Strawn, L., Dalenius, K., Galuska, D., Anandappa, M., Borland, E., … Smith, R. (2009). Obesity Prevalence Among Low-Income, Preschool-Aged Children - United States, 1998-2008. *Morbidity and Mortality Weekly Report*, *58*(28), 769–773.

Shediac-Rizkallah, M. C., & Bone, L. R. (1998). Planning for the sustainability of community-based health programs: Conceptual frameworks and future directions for research, practice and policy. *Health Education for Research*, *13*(1), 87–108.

Singh, A. S., Mulder, C., Twisk, J. W. R., Mechelen, W. Van, & Chinapaw, M. J. M. (2008). Tracking of childhood overweight into adulthood :, (ii), 474–488. http://doi.org/10.1111/j.1467-789X.2008.00475.x

Skinner, A. C., Ravanbakht, S. N., & Skelton, J. (2018). Prevalence of Obesity and

Severe Obesity in US Children, 1999 – 2016. *Pediatrics*, *141*(3).

Sobal, J., Khan, L. K., & Bisogni, C. (1998). A conceptual model of the food and nutrition system. *Social Science & Medicine (1982)*, *47*(7), 853–63. http://doi.org/10.1016/S0277-9536(98)00104-X

Sotero, M. M., & Vegas, L. (2006). A Conceptual Model of Historical Trauma : Implications for Public Health Practice and Research, *1*(1), 93–107.

Stang, J., Zephier, E., & Story, M. (2005). Dietary Intakes of Nutrients Thought to Modify Cardiovascular Risk from Three Groups of. *Journal of the American Dietetic Association2*, *105*(12), 1895–1903. http://doi.org/10.1016/j.jada.2005.09.003

StataCorp. (2017). Stata Statistical Software: Release 15. College Station, TX: StataCorp, LLC.

Stirman, S. W., Kimberly, J., Cook, N., Calloway, A., Castro, F., & Charns, M. (2012). The sustainability of new programs and innovations : a review of the empirical literature and recommendations for future research, 1–19.

Story, M., Strauss, K., Zephier, E., & Broussard, B. (1998). Nutritional concerns in American Indan and Alaska Natvie children: Transitions and future directions. *Journal of the Academy of Nutrition and Dietetics*.

Tables of Summary Health Statistics: National Health Survey, 2014. (2016a). Table A-15. Retrieved July 1, 2017, from https://www.cdc.gov/nchs/nhis/shs/tables.htm

Tables of Summary Health Statistics: National Health Survey, 2014. (2016b). Table A-4. Retrieved July 20, 2007, from https://www.cdc.gov/nchs/nhis/shs/tables.htm

The Food Trust. (2012). *What Is Policy, Systems and Environmental (PSE) Change?*

Retrieved from http://healthtrust.org/wp-content/uploads/2013/11/2012-12-28-Policy_Systems_and_Environmental_Change.pdf

Tu, A. W., Lear, S. A., Gotay, C. C., & Richardson, C. G. (2016). and childhood obesity. *Canadian Journal of Public Health*, *107*(2), e168–e175. http://doi.org/10.17269/CJPH.107.5268

University of North Carolina at Chapel Hill. (n.d.-a). *American Indian Healthy Eating: Tools for Healthy Tribes*. Retrieved from http://americanindianhealthyeating.unc.edu/tools-for-healthy-tribes/

University of North Carolina at Chapel Hill. (n.d.-b). American Indian Healthy Eating. Retrieved from http://americanindianhealthyeating.unc.edu/tools-for-healthy-tribes/

Verbeeten, K. C., Elks, C. E., Daneman, D., & Ong, K. K. (2010). Review Article Association between childhood obesity and subsequent Type 1 diabetes : a systematic review and meta-analysis, 10–19. http://doi.org/10.1111/j.1464-5491.2010.03160.x

Wagner, K.-H., & Brath, H. (2012). A global view on the development of non communicable diseases. *Preventive Medicine*, *54 Suppl*, S38-41. http://doi.org/10.1016/j.ypmed.2011.11.012

Wall, M. M., Larson, N. I., Forsyth, A., Riper, D. C. Van, Graham, D. J., Story, M. T., & Neumark-sztainer, D. (2012). Patterns of Obesogenic Neighborhood Features and Adolescent Weight. *American Journal of Preventive Medicine*, *42*(5), e65–e75. http://doi.org/10.1016/j.amepre.2012.02.009

Walls, M. L., & Whitbeck, L. B. (2012). Advantages of stress process approaches for measuring historical trauma. *The American Journal of Drug and Alcohol Abuse*,

38(5), 416–20. http://doi.org/10.3109/00952990.2012.694524

Warne, D. (2011). Policy Issues in American Indian Health Governance. *The Journal of Law, Medicine & Ethics*, *39*(1_suppl), 42–45. http://doi.org/10.1111/j.1748-720X.2011.00564.x

Warne, D., & Frizzell, L. B. (2014). American Indian Health Policy: Historical trends and contemporary issues. *American Journal of Public Health*, *104*(SUPPL. 3), 263–267. http://doi.org/10.2105/AJPH.2013.301682

Wheelock, K. M., Sinha, M., Knowler, W. C., Nelson, R. G., Fufaa, G. D., & Hanson, R. L. (2016). Metabolic Risk Factors and Type 2 Diabetes Incidence in American Indian Children. *The Journal of Clinical Endocrinology and Metabolism*, *101*(4), 1437–44. http://doi.org/10.1210/jc.2015-4309

WHO Expert Committee. (1995). Physical status: the use and interpretation of anthropometry. Report of a WHO Expert Committee. *World Health Organization Technical Report Series*. http://doi.org/854

Wiedman, D. (2005). American Indian Diets and Nutritional Research: Implications of the Strong Heart Dietary Study, Phase II, for Cardiovascular Disease and Diabetes. *Journal of the American Di*, *105*(12), 1874–1880. http://doi.org/10.1016/j.jada.2005.10.016

Wiedman, D. (2012). Native American Embodiment of the Chronicities of Modernity: Reservation Food, Diabetes, and the Metabolic Syndrome among the Kiowa, Comanche, and Apache. *Medical Anthropology Quarterly*, *26*(4), 595–612. http://doi.org/10.1111/maq.12009

Wollin, A. (1999). Punctuated equilibrium: reconciling theory of revolutionary and

incremental change. *Systems Research and Behavioral Science*, *16*(4), 359–367. http://doi.org/10.1002/(SICI)1099-1743(199907/08)16:4<359::AID-SRES253>3.3.CO;2-M

World Health Organization. (2005). *Chronic diseases and their common risk factors*. Geneva. Retrieved from http://www.who.int/chp/chronic_disease_report/media/Factsheet1.pdf?ua=1

Yach, D., Stuckler, D., & Brownell, K. D. (2006). Epidemiologic and economic consequences of the global epidemics of obesity and diabetes. *Nature Medicine*, *12*(1), 62–6. http://doi.org/10.1038/nm0106-62

Zephier, E. M., Ballew, C., Mokdad, A., Mendlein, J., Smith, C., Yeh, J. L., … Howard, B. (n.d.). Intake of nutrients related to cardiovascular disease risk among three groups of American Indians: the Strong Heart Dietary Study. *Preventive Medicine*, *26*(4), 508–15. http://doi.org/10.1006/pmed.1997.0164

Zhang, X., Lans, I. Van Der, & Dagevos, H. (2011). Impacts of fast food and the food retail environment on overweight and obesity in China : a multilevel latent class cluster approach, *15*(1), 88–96. http://doi.org/10.1017/S1368980011002047

Curriculum Vitae

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Education

Johns Hopkins University, Baltimore, MD **2013 – 2018**

Bloomberg School of Public Health (JHSPH)

- PhD Candidate, Social and Behavioral Interventions Program
- Department of International Health
- Topic of Dissertation: Development of a policy-based intervention to improve the physical activity and food environments in Native communities

Johns Hopkins University, Baltimore, MD **2010-2012**

Bloomberg School of Public Health (JHSPH)

- MHS, Department of Epidemiology
- Concentration: General Epidemiology and Methodology
- Thesis: Association of type 2 diabetes diagnosis with self-efficacy among four Native communities participating in the OPREVENT Trial

Syracuse University, Syracuse, NY **2006-2010**

College of Arts & Sciences

- BS, Department of Chemistry
- Minor in Mathematics

PROFESSIONAL EXPERIENCE

QUALITATIVE RESEARCH EXPERIENCE

- *Research Assistant* **May 2014 – Dec 2016**

Worked with Dr. Jessica Jones-Smith's research team to investigate the potential mechanisms between tribal gaming expansion or development and decreased childhood obesity. Duties include providing qualitative research training, planning data collection, conducting in-depth interviews with Tribal leaders, and providing guidance to research team on qualitative research methods.

COMMUNITY-BASED INTERVENTION EXPERIENCE

- *Research Assistant* **Nov 2014 – Present**

Worked on the OPREVENT2 research project as a Student Co-Investigator and Community Action Component Lead. Led the formative research and implementation of the Community Action Component. Duties include developing, designing evaluation, and implementing pilot of component, and hosting working group meetings.

- *Data and Analysis Manager for Dr. Joel Gittelsohn, JHSPH* **July 2012 – July 2013**

Worked as OPREVENT intervention coordinator while managing and guiding analyses for Dr. Joel Gittelsohn's past and current studies including: OPREVENT, BHRR, BHCK, and MHSII. OPREVENT-specific duties include managing IRB approvals, assisting with intervention materials development, grant writing, managing data entry and quality, writing and managing manuals of procedures, providing interventionist and teacher trainings, managing intervention orders and printing, and facilitating OPREVENT staff meetings.

- *Special Studies and Research in Human Nutrition, JHSPH* **Terms 1-4, 2011-2012**

Worked as student investigator on Dr. Joel Gittelsohn's multilevel obesity prevention project (OPREVENT) while pursuing master's degree. Duties include arranging meetings, writing minutes, developing instruments and intervention manuals of procedure, data management, and creation and maintenance of ACCESS databases.

PUBLIC HEALTH POLICY

- *Health Canada First Nations and Inuit Health Branch – Primary Health Care and Public Health Directorate, Communicable Disease Control Division* **Summer 2011**

Researched and authored social marketing strategy for Division to inform Strategic Plan, helped to enter data on Performance Measurement Strategy Reports, and updated TB team on novel TB diagnostics, treatments and vaccines.

- *Health Canada First Nations and Inuit Health Branch – Primary Health Care and Public Health Directorate, Director General's Office* **Summer 2010**

Researched and authored a review of the overall descriptions of Core/Mandatory public health programs of the Branch and the Provinces.

- *Health Canada First Nations and Inuit Health Branch – Primary Health Care and Public Health Directorate, Director General's Office* **Summer 2009**

Researched and authored "Lessons Learned from Partnerships That Aim to Influence Social Determinants of Health" and researched and compiled a comparative of public health policies between Provinces / Territories in Canada.

- *Health Canada First Nations and Inuit Health Branch – Health Systems Development Division, International Team* **Summer 2008**

Followed the development of the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) Tuberculosis file, wrote meeting minutes, coordinated executive travel, and researched international tuberculosis issues.

- *Health Canada First Nations and Inuit Health Branch – Strategic Policy, Planning, and Analysis Directorate* **Summer 2007**

Maintained and updated progress of activities in environmental health and youth health status within Canada, as well as administrative assistant duties.

TEACHING EXPERIENCE

- *Teaching Assistant for Qualitative Research Theory and Methods & Data Analysis Classes* **Terms 3-4 2015**

Lab coordinator for the course which required the following duties: organizing TA lab schedules for the term, developing PowerPoint slides for lab, leading lab sessions, and coordinating weekly TA meetings. Other duties include grading assignments, providing feedback on interviewing technique, and providing guidance to student research teams.

- *Teaching Assistant for Fundamentals of Epidemiology* **Fall 2014**

Worked as an instructor for one lab section. Led and managed class discussions and activities in weekly sessions. Other duties include grading, attending office hours, and attending weekly instructor meetings.

- *Tutor for Epidemiologic Methods Course (Epi 753), JHSPH* **Term 3, 2012**

Offered one-on-one instruction on epidemiologic methods related to regression analyses.

- *Teaching Assistant for Epidemiologic Methods (Epi 752), JHSPH* **Term 2, 2011**

Duties include leading lab discussions, attending office hours, grading, and attending faculty meetings

HONORS AND AWARDS

- *Research in Diverse Populations Special Recognition* **2017**

Recognized the top ten posters from the Research in Diverse Populations Section at the Obesity Society Annual Meeting in 2017.

- *Beatrice Medicine Travel Award Scholarship* **2017**

This award celebrates the life and legacy of Dr. Beatrice Medicine, a prominent anthropologist and member of the Standing Rock Sioux Tribe. The award provides travel support to two students to attend the Society for Applied Anthropology Annual Conference.

- *JHSPH Student Assembly Student Travel Award* **2017**

Received support to attend The Obesity Society Annual Meeting.

- *Seeds of Native Health Nutrition Conference Travel Award* **2016**

Received a travel award to attend the first annual conference on Native American Nutrition

- *NCAI Native Graduate Health Fellowship* **2016**

The Fellowship aims to address the stark disparities in Native health by building a pipeline of Native health professionals to lead in formulating and promoting health policies and practices that address the unique needs of American Indians and Alaska Natives. Six fellows were selected to take part in professional development opportunities and receive a monetary award towards their graduate studies.

- *Native Research Network Student Scholarship* **2016**

The Native Research Network provides annual scholarships for students to attend their conferences.

- *American Indian, Alaska Native, and Native Hawaiian Caucus Student Travel Scholarship* **2015**

Awarded travel scholarships to American Indian, Alaska Native and Native Hawaiian students to attend the 143rd APHA Annual Meeting. The conference focused on addressing policy issues in an effort to prevent disease and promote health.

- *Saint Regis Mohawk Elementary School Graduation Keynote Speaker* **2012**

Selected to speak to the graduating class of the Saint Regis Mohawk elementary school to encourage educational development. Speech emphasized exploring passions and trying new activities while respecting student's individual gifts as well as the gifts of others.

- *Gates Millennium Scholar* **2006**

The Gates Millennium Scholars program provides substantial scholarship awards to exceptional high school seniors for undergraduate studies and beyond at the institution of their choice. Eligible applicants must have a minimum grade point average of 3.3 on a 4.0 scale, demonstrated leadership skills, and community service.

- *Haudenosaunee Promise Scholarship* **2006**

A Syracuse University scholarship for citizens of historic Haudenosaunee Nation members. Was part of the inaugural class of students.

PUBLICATIONS

SUBMITTED JOURNAL ARTICLES

- Setiono F, **Jock B**, Wensel CR, Trude A, Poirier L, Pardilla M, Gittelsohn J. Associations between Food Consumption Patterns and Chronic Diseases and Other Health Outcomes in Six Native American Communities. Manuscript submitted to *Current Developments in Nutrition* **2018**
- Redmond LC, **Jock B**, Gadhoke P, Christiansen K, Pardilla M, Swartz J, Caulfield LE, Gittelsohn J. OPREVENT: Design of a multi-level, multi-component obesity intervention for Native American adults and households. Submitted to Current Developments in Nutrition. 2018 **2018**
- Redmond L, **Jock B**, Pardilla M, Swartz J, Gittelsohn J. Multi-level, Multi-component Obesity Intervention Decreases Soda Intake and Encourages Physical Activity in American Indian Adults: Results of a Randomized Controlled Trial. Submitted to Journal of Academy of Nutrition and Dietetics May 2018. **2018**
- Gittelsohn J, **Jock B**, Redmond L, Fleischhacker S, Eckmann T, Bleich SN, Loh H, Ogburn E, Gadhoke P, Swartz J, Pardilla M, Caballero B. OPREVENT2: Design of a multi-institutional intervention for obesity control and prevention for American Indian adults. BMC Public Health. 2017;17(1):105. **2017**

- Chodur GM, Shen Y, Kodish S, Oddo VM, Antiporta DA, **Jock B**, Jones-Smith JC. Food Environments around American Indian Reservations: A Mixed Methods Study. PLoS One. 2016; 11(8) **2016**
- Trude A, Kharmats A, **Jock B**, Liu D, Lee K, Martins PA, Pardilla M, Swartz J, Gittelsohn J. "Patterns of Food Consumption are Associated with Obesity, Self-Reported Diabetes and Cardiovascular Disease in Five American Indian Communities". Ecology of Food and Nutrition. 2015;54(5):437-454. **2015**
- Cuccia A, Powell L, Budd N, Jeffries J, **Jock B**, Liu D, Gittelsohn J. "Patterns of Food Source Usage Among Low-Income Urban African Americans are Associated with Dietary Intake," (Manuscript submitted *to Ecology of Food and Nutrition*). **2013**

REPORTS

- Poirier L, **Jock B**, Gittelsohn J. Johns Hopkins Bloomberg School of Public Health, "Community OPREVENT2 Baseline Reports" Baltimore, MD. **2017**
- **Jock B**, Peake M. Communicable Disease Control Division Social Marketing Strategy. (Submitted to Director General) **2011**
- **Jock B**, LeVasseur R, Walker D, Woods SJ. Core/Mandatory Public Health Programs. (Submitted to Director General) **2010**
- **Jock B**, LeVasseur R, Walker D, Woods SJ. Lessons Learned from Partnerships That Aim to Influence Social Determinants of Health. (Submitted to Director General) **2009**

CONFERENCE PRESENTATIONS

ORAL PRESENTATIONS

- **Jock B,** LeVasseur R, Walker D, Woods SJ. Lessons Learned from Partnerships that Aim to Influence Social Determinants of Health. National Aboriginal Health Organization National Conference Presentation. **2009**

POSTER PRESENTATIONS

- Leslie R, **Jock B**, Pardilla M, Gittelsohn J. Participation in Food Assistance Programs and Cardiometabolic Risk Among American Indian Adults. The Obesity Society Annual Meeting. Washington, DC **2017**
- **Jock B**, Redmond R, Swartz J, Gittelsohn J. Improving implementation of multilevel, multicomponent interventions in Native American communities. The Obesity Society Annual Meeting at ObesityWeek 2017. Washington, DC **2017**
- Bennett E, **Jock B**, Poirier L, Pardilla M, Platero H, Vigil T, Swartz J, Taguma L, Dubek M, Gittelsohn J. OPREVENT2 obesity prevention program baseline characteristics, chronic disease and behavioral patterns in participating Navajo communities. Navajo Nation Research Conference, Window Rock, AZ: October 18-19, 2017. **2017**
- Pardilla M, **Jock B**, Poirier L, Bennett E, Platero H, Vigil T, Swartz J, Taguma L, Dubek M, Gittelsohn J. OPREVENT2 community member workshop and community engagement: a novel approach to revising **2017**

materials. Navajo Nation Research Conference, Window Rock, AZ: October 18-19, 2017.

- **Jock B,** Jacqueline Swartz, Joel Gittelsohn. Recognizing the history of genocidal policies is foundation to promoting the use of health policies in tribal communities. Society for Applied Anthropology. **2017**
- **Jock B,** Kodish SR, Jones-Smith J. Avoiding a "Crawl Through Blackberries": Lessons learned from California tribal leaders and perspectives from tribal members. Society for Applied Anthropology. **2016**
- **Jock B,** Eckmann T, Pardilla M, Swartz J, Platero H, Gittelsohn J. "OPREVENT2 Study Design and Intervention Activities." Navajo Nation Research Conference, Window Rock, AZ: October 21, 2015. **2015**
- **Jock B**, Pardilla M, Gittelsohn J. Engaging Tribal Policymakers to Promote Healthy Eating and Physical Activity in a Multicomponent Obesity Prevention Study. American Public Health Association **2015**
- Gittelsohn J, **Jock B**, Pardilla M, Swartz R. Implementation and Impact of OPREVENT: A Multilevel, Multicomponent Obesity Prevention Program in Five American Indian Communities. 2014 SNEB Poster **2014**
- Gittelsohn J, **Jock B**, Pardilla M, Swartz J, Platero H. Process evaluation of a multilevel, multicomponent obesity prevention program in five Native American communities. Experimental Biology Meeting Abstracts, Abstract #617.17. **2013**

- Gittelsohn J, **Jock B**, Pardilla M, Swartz J, Platero H. Process evaluation of a multilevel, multicomponent obesity prevention program in five Native American communities. 2013 NNHRRB Conference **2013**
- Budd N, Liu D, Cuccia A, **Jock B**, Jeffries J, Frick K, Gittelsohn J. Food insecurity is not associated with body mass index (BMI) among low-income African American (AA) adult residents in Baltimore City. Experimental Biology. **2013**
- Cuccia A, Budd N, Liu D, **Jock B**, Jeffries J, Powell L, Gittelsohn J. Patterns of food source usage among low-income African Americans are associated with dietary intake. Experimental Biology. **2013**
- Liu D, Budd N, Cuccia A, **Jock B**, Jeffries J, Katz F, Gittelsohn J. Identifying healthy foods for promotion in an urban corner store intervention. Experimental Biology. **2013**
- Gittelsohn J, **Jock B**, Pardilla M, Swartz J, Platero H, Arnold K. "Implementation of OPREVENT: A Multilevel, Multicomponent Obesity Prevention Program in 5 American Indian Communities. Journal of Nutrition Education and Behavior. 2013;45(4):282 **2013**

STUDENT GROUPS

- *JHSPH Native Circle Student Group member* **2010-Present**

The student group plans activities and works to provide support to Native researchers at JHU.

- *JHSPH Native Circle Co-President* **2010-2015**

The student group aims to bring awareness to Native American health issues. Helped plan and coordinate keynote speakers, quarterly journal clubs, and cultural events throughout the year and during Native American Heritage Month.

- *Native American Students at Syracuse (NASAS) Member* **2006-2010**

NASAS organizes cultural events and networking activities for Native American students attending Syracuse University.

- *Daughters of Tradition Member* **2005-2006**

This youth group was formed to give young ladies of Akwesasne an understanding of their backgrounds and how to become a respectful and

TRIBAL AFFILIATION

Saint Regis Mohawk Tribe

Mohawks of Akwesasne